WATER QUALITY

Mid-Nebraska Demonstration Project

1992

Field Demonstrations of Best Management Practices to Protect Groundwater Quality

Soil Conservation Service
University of Nebraska Cooperative Extension

SCREC 93/1

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- Tri-Basin Natural Resources District
- Little Blue Natural Resources District
- Lower Republican Natural Resources District
- Blue River Association of Groundwater Conservation Districts
- UNL Conservation and Survey Division
- USDA Agricultural Research Service
- Nebraska Department of Environmental Quality

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Nebraska Sustainable Agricultural Society
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Nebraska Independent Crop Consultants Association
Nebraska Bankers Association

1992 Report

Mid-Nebraska Water Quality Demonstration Project

The Mid-Nebraska Water Quality Demonstration Project (MNWQDP) began in March, 1990 with the authorization of USDA funds from President Bush's Water Quality Initiative. One of eight projects selected nation-wide in 1990, the project has four objectives:

1. Foster the adoption of management practices that will reduce nutrient and pesticide loading in the soil.

2. Promote producer adoption of irrigation management practices that provide adequate moisture to growing crops while reducing the leaching of agricultural chemicals to the groundwater.

3. Demonstrate that producers can achieve suitable economic returns while utilizing management practices that reduce inputs and chemical leaching to groundwater.

4. Effectively address critical water quality issues in Nebraska by integrating the resources and expertise of appropriate federal, state and local agencies and organizations.

Project Description

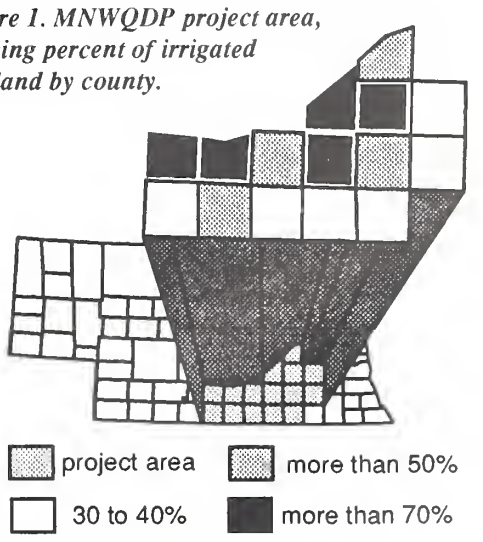
The upland areas of central Nebraska, south of the Platte river, are characterized by medium- to fine-textured loess soils that overlie groundwater that is 50- to 150-feet deep.

Groundwater is abundant in this south-central Plains region. Sand and gravel of Pliocene and Pleistocene age and the Ogallala Group of Miocene age in the west have yielded large quantities of quality groundwater. Nitrate-nitrogen movement under fine-textured soils such as this has not been perceived as an imminent threat to groundwater quality because of the relatively slow movement of water and nitrate in these soils and because of the depth to the aquifer.

There are 3.4 million acres of cultivated land in the 15-county area encompassed by the Mid-Nebraska Water Quality Demonstration Project (see map below). This area has been irrigated for more than 60 years and continuous corn production is the most common agricultural practice on the majority of the irrigated acres. The investments made in irrigation capabilities and the USDA farm program provisions strongly influence cropping decisions in this area.

The 15-county project area encompasses some of the most productive corn-producing acres in Nebraska. While the area accounts for less than 22 percent of the cultivated acres in the state, it produces 35 percent of the corn and accounts for over 30 percent of the nitrogen fertilizer used.

Figure 1. MNWQDP project area, showing percent of irrigated cropland by county.



1989 NE Agricultural Statistics, NE Dept. of Ag.

Water Quality Problems

There is no critical widespread nitrate problem in the groundwater underlying the 15-county project area at this time, but the intensive, irrigated agricultural practices in south-central Nebraska create the potential for water quality problems. There is evidence from local, state and federal agencies' studies that groundwater nitrate levels were on the rise when this project began and a nitrate load does exist in the vadose zone.

Many research projects have documented the relationship between nitrogen application and nitrate load in the vadose zone (that area between the root zone and the groundwater). One study, done in 1988, showed the movement of nitrate to a depth of 60 feet over a 15-year period under excessively fertilized plots. The vadose-zone nitrate load was documented on several farms in the area from 1986 through 1990.

This substantial amount of nitrate is at depths that deep-rooted crops cannot reach. Comparison studies have been done on pastures having no history of nitrogen fertilization. The results suggest that the load is not natural, but has come from applied fertilizer.

The premise behind the Mid-Nebraska Project is that fertilizer and waste products are being applied in much of the project area in a manner that allows excessive amounts of unused nitrate to reside in the soil. Poorly timed and/or poorly distributed irrigation water (combined with rainfall) then carries nitrate below the root zone. Records of residual nitrate in the root zone prior to fertilization for the next crop support the assumption of excess nitrogen application.

Pesticide contamination of the groundwater in this area is not widespread. The only pesticide found in the groundwater of this area with some regularity is atrazine.

The soils of this area have a medium- to low-leaching potential, according to Soil Conservation Service characterization. Computer models suggest that atrazine would not be expected to penetrate these soils to the groundwater. There is no current, conclusive evidence that atrazine in these wells is from a non-point source. Sites have been sampled to determine the extent of atrazine leaching.

Best Management Practices Demonstrated

The Mid-Nebraska Water Quality Demonstration Project hopes to achieve its objectives through the use of demonstrated best management practices (BMPs).

Thirty-four irrigated-crop producers throughout the 15-county area have volunteered their land and time to establish sites that demonstrate the recommended BMPs for their locale and situtation.

The practices to be demonstrated throughout the project area are:

1. Deep soil sampling and analysis to estimate available soil nitrogen.
2. Irrigation water testing to estimate the irrigation water nitrogen contribution.
3. Selecting realistic yield goals based on field history.
4. Irrigation scheduling to efficiently apply proper amounts of irrigation water.
5. Using irrigation flow meters to accurately measure applied irrigation water.
6. Using an integrated pest management (IPM) approach to minimize pesticide applications, and to optimize their efficiency when applied.
7. Using irrigation surge valves to more uniformly apply irrigation water.

8. Using delayed nitrogen application (sidedress and/or fertigation) to more efficiently use fertilizer nitrogen.

9. Using nitrification inhibitors to delay nitrification, restrict leaching, and increase nitrogen use efficiency.

10. Allowing proper nutrient credits for preceding legume crops.

11. Allowing proper nutrient credits for manure, compost, sewage sludge and other waste products.

12. Applying manures and other waste products by methods to allow efficient use of nutrients contained in the products.

13. Minimizing irrigation water runoff through the use of proper land leveling, reuse basins, and surge valves.

14. Using proper pesticide mixing and application procedures to prevent point-source contamination, either at the farmstead or in the field.

15. Using crop rotations to reduce nitrogen fertilizer use and impact of insect and weed infestations.

16. Using winter cover crops to retain residual soil nitrate between growing seasons.

A Demonstration Site

A demonstration site is an entire field owned and operated by a local producer/cooperator. A field history is developed by the operator in consultation with the local county extension agent, district conservationist and the project technologist. Problems, both routine and those unique to the site, are identified and the operator describes the management plan that will address these problems while still attaining a reasonable yield with minimum risk of chemicals leaching beyond the root zone.

A local committee, made up of producers and agency and agribusiness representatives from that county, has input on which practices should be highlighted as a demonstration for area producers. These specific practices are contained in the field at a smaller scale to minimize the risk associated with comparing against non-recommended practices that are in common use in the area.

Nitrogen Management Activities

Common to most of the demonstration sites are field-length strips showing nitrogen management. Each strip is the width of the nitrogen fertilizer applicator, a minimum of six rows wide. Each strip is under one treatment for the entire five year's duration of the project.

The nitrogen treatments are developed using a University of Nebraska-Lincoln formula that includes the following factors:

- Yield goal equals the average yield for the past five years, plus five percent.
- Research-based information for nitrogen required to meet the yield goal.
- Credit for soil nitrate in the root zone based on four-foot deep soil samples.
- Credit for irrigation water nitrate based on nitrate test of well water during the previous season.
- Credit for previous legume crop such as soybeans or alfalfa.
- Credit for manure applications.

The nitrogen fertilizer is then applied in side-by-side comparison strips. The strips include the recommended rate, a rate of 50 pounds more nitrogen than recommended, and a rate with 50 pounds less nitrogen than recommended (see Figure 2). These three treatments are repeated four times in the field resulting in 12 nitrogen treatment strips.

The strips are combine-harvested, weighed in a weigh wagon and adjusted to 15.5 percent moisture. Soil samples are taken from each strip during the autumn. Nitrogen treatments for the next year are based on the residual nitrate in the recommended-rate strips.

Irrigation Management Activities

Water management activities in a demonstration project are unlike nitrogen management activities in that replicated strip plots or trials are rarely possible. Statistically valid comparisons depicting the outcome or effect of practices are limited by land, labor, and time constraints, and are often severely confounded by the spatial variability of soil, water application, and topographic conditions.

The extent to which water management activities may be applied depends on the practices and conditions associated with each site. The activities promoted in this project are generally those which have had historically documented success, and have a high probability of success under the conditions of a given site.

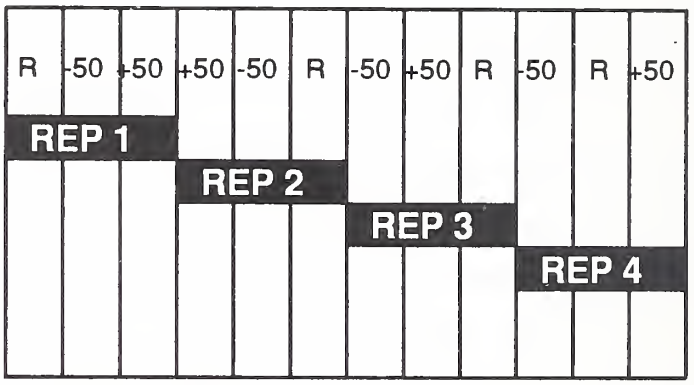
The water management activities demonstrated in this project are:

1. proper irrigation scheduling methods
2. metering flows to reduce gross application
3. surge irrigation
4. irrigation systems alterations that reduce deep percolation
5. management strategies that encourage more effective water use.

In the water management activities of the MNWQDP, cooperators are encouraged to keep accurate and detailed information on their irrigation practices. This includes:

- Cooperators meter all irrigation applications and record rainfall amounts throughout the irrigation season.
- Cooperators are required to have access to an acceptable irrigation scheduling practice. The recommended irrigation scheduling methods include the checkbook (volume balance) method, appearance and feel techniques, the use of tensiometers, resistance blocks, or atmometers, computer based schedulers, or other advanced techniques. Day-to-day irrigation scheduling activities may be the responsibility of the cooperator, a commercial crop consultant, a project technologist, or an employee of a cooperating agency.
- Project personnel work closely with each cooperator to recommend different practices (or changes in existing practices) that have a high probability of enhancing the performance of the cooperator's irrigation system. Cooperators are presented with options that, if they so choose, may be implemented at their site. Project personnel then assist in the design, installation, operation and maintenance of the practices that the cooperator has designated, primarily in an advisory or technical assistance role.

Figure 2. Example of plot layout for nitrogen rate strips.



R = UN-L recommended rate

A major principle associated with water management activities is that the wholesale adoption of historically proven practices can only result in positive changes in the interaction between on-farm water management and groundwater quality and quantity.

Pest Management Activities

Pests include insects, weeds and diseases. They are considered managable factors in crop production. An integrated approach is one that includes cultural practices and pesticides when appropriate. Accurate field information is the key to integrated pest management (IPM).

Some of the cultural practices that reduce the risk to groundwater are crop rotation, cultivation, and the placement, timing, selection and rate of pesticide application.

Crop rotation helps in several ways. Corn rootworm insecticide is usually eliminated as the beetles will not lay significant numbers of eggs in the rotated crops. Alternating types of plants (grasses and broadleaf, annual and perennial) disrupts the environment for weeds and insects. This disruption and increased herbicide alternatives, often reduces the need for herbicides.

Crop rotation also enhances **cultivation**. Weed pressure is often reduced and banded herbicide treatments are more likely to keep the rows clean.

Placement, timing, selection and rate of pesticide use controls the product effectiveness. Treatments that are poorly applied lead to reduced yields, or re-treatment -- a costly outcome in either case. Most herbicide treatments are banded to reduce quantity and expense, relying on the cultivator for weed control between rows. Rootworm soil insecticides are more effective if applied at first cultivation. European corn borer control and rootworm beetle control are also affected by timing of application.

All of the pest control decisions revolve around **accurate field scouting data**. Field maps that identify areas with particular weed problems or soil insects are of particular use. Accuracy in scouting is dependent on the number of areas sampled and location of those areas. Two or three locations near field borders are not adequate for developing an accurate picture of what is occurring in the field.

Incomplete data is of little use. For example, European corn borer treatment thresholds have been developed through extensive university research. To adequately use these threshold calculations for first generation borer, one must know percentage of plants with shotholes plus the number of live borers per plant. Since the thresholds have been developed based on amount of crop loss per live borer, merely knowing percent shotholed plants is inadequate.

University of Nebraska publications that can be used in an integrated pest management plan are listed below.

Neb Guides

G-217	*European Corn Borer*
G-382	*Right Crop Stage For Herbicide Use*
G-471	*Choosing Corn Hybrids*
G-613	*Ear Attacking Insects of Corn*
G-774	*Western Corn Rootworm Soil Insecticide Treatment Based on Beetle Numbers*
G-839	*Corn Rootworm Control*
G-904	*Corn Insects - Quick Reference*
G-1031	*How to Hire a Crop Consultant*

Other Extension Publications

EC-130	*Herbicide Use In Nebraska--Guide*
EC-1509	*Insect Management Guide for Nebraska Corn and Sorghum*
EC-1511	*Insect Management Guide for Nebraska Alfalfa, Soybeans, Wheat, Range and Pasture*

Computer Software

CP5	*Nebraska European Corn Borer*
CP11	*NebraskaIIERB*

Summary of Results - 1992

Nitrogen Management

Nitrogen (N) fertilizer rate comparisons were made at 28 demonstration sites in 1992. At 26 of these sites, N fertilizer was applied in replicated, field-length strips at the recommended N rate and rates 50 pounds/acre above and below the recommended rate. The recommended rate was determined by following the University of Nebraska procedures, including credits for N available from soil, irrigation water, legumes, and manures.

Soil samples were taken to a depth of four feet to determine residual soil nitrate levels on 33 of the sites. Three sites had legume credits for soybeans as the previous crop, and two sites received credit for manure application. Irrigation water credit for nitrate-nitrogen was made on 22 sites ranging from two pounds to 36 pounds per acre. Only one site had groundwater nitrate-nitrogen levels above 10 parts per million (ppm).

The average yield goal for the 26 sites with N-rate strips was 178 bushels/acre, with a range from 160 to 200 bushels/acre. Figure 3 shows that most of the yield goals were realistic, bracketing the 1:1 line where actual yield equals yield goal.

Recommended N fertilizer rates for the sites ranged from zero to 222 pounds/acre, depending on yield goal and N credits. The average recommended N rate for the 26 sites was 147 pounds/acre.

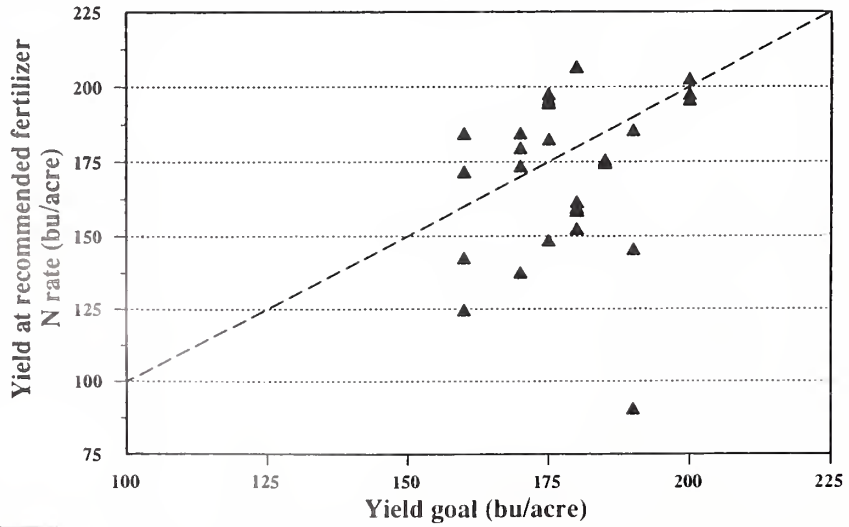
The average yields for the 26 sites with the comparison strips were:

- recommended rate - **167 bu/A**
- -50 lb/acre rate - **157 bu/A**
- +50 lb/acre rate - **172 bu/A**

Twelve sites exceeded their yield goal with the recommended rate, while 15 sites were under their yield goal. Of those that did not make the yield goal, only three reached the yield goal with the high rate of fertilizer. Mid-season aerial photographs revealed significant losses of nitrogen in 1992, showing up as mottled yellow and light green patches within the fields. Fields that were not excessively fertilized had lower yields than the high rate fields under these conditions. Nitrogen was likely lost to a combination of leaching and denitrification due to above-average precipitation in July. (See Figure 4 on page 9.)

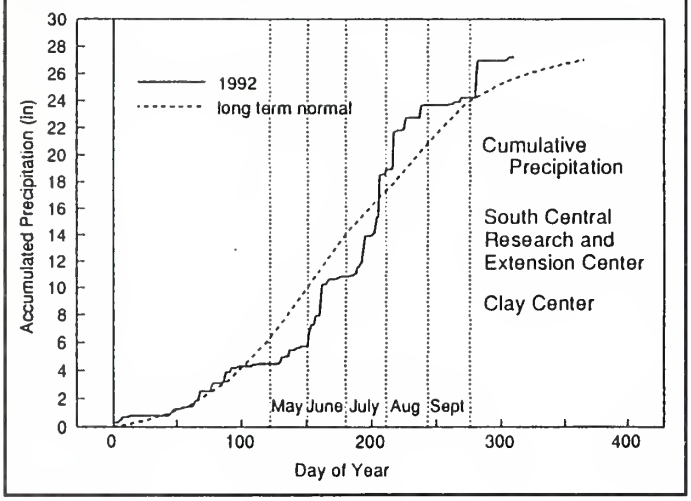
Storms also took their toll in 1992. One site in Phelps County was replanted to milo following severe frost damage. Three other sites were injured to some extent by frost. Hail caused losses that

Figure 3. Yield goals at the sites with N-rate comparison strips.



ranged as high as 60 percent on several sites and a tornado injured a crop and destroyed a homestead at a Saline County site.

Figure 4: Cumulative Precipitation



An added attraction to the project in 1992 was the evaluation of variable rate anhydrous ammonia fertilizer application. Two fields were sampled for residual nitrogen on a 200-foot grid (see Milton Ruhter Site 9 in this report). The resulting map was used at the Ruhter site to apply the nitrogen with equipment that allows computer control of application rates to match variable nitrogen needs across the field. Results are shown with the Site 9 data.

Irrigation Water Management

All 35 of the demonstration sites were irrigated. Irrigation water was monitored with flow meters at 32 of the sites. The wet weather of 1992 minimized the need for irrigation and four sites did not irrigate at all.

The average rainfall on the sites was 17 inches. The average gross irrigation on the 23 gravity-irrigated corn sites was 5.25 inches/acre. Six sites had corn under center-pivot irrigation, applying an average of 3.95 inches/acre.

Irrigation scheduling was provided by the consultants and technologists in most cases. Some farmers provided their own scheduling and one hired the Blue River Association of Groundwater Conservation Districts to schedule. The checkbook method or some version of it was used in all cases. This system estimates available water, expected crop water use and projects the date to irrigate in order to prevent soil water depletion to yield-restricting levels. Soil moisture was estimated using moisture blocks at 17 sites. All other sites relied on the hand-feel method.

Irrigation on gravity flow systems was applied with an "every-other-row" technique at nine sites. Thirteen sites utilized re-use systems to collect runoff and re-use the water on the same or different sites.

Surge valves were used on 11 sites. Surge valves are devices that help farmers adjust set-times in order to apply irrigation water more uniformly.

Irrigation water management practices are crucial to decreasing the amount of water that can leach below the root zone. Poor water distribution and applications that saturate the soil below the root zone are primary factors in the movement of nitrates toward groundwater. These demonstrated practices provide for the transfer of technology beyond the demonstration sites. Agency personnel and the general public have the opportunity to see how these practices are implemented, and work, in a field situation.

Integrated Pest Management

Field-scouting reports were the basis for treatment decisions on the project demonstration sites. Most fields were scouted by crop consultants. Project technologists and farmers scouted four sites.

University research-based thresholds were used when possible. These thresholds are classified as static (those that have a set level) and dynamic (those that have variables). Corn rootworm management utilizes a static threshold while European corn borer management uses dynamic thresholds for first and second generations.

The rootworm threshold relates to rootworm beetle counts. One can predict with a high degree of confidence that rootworm larvae pressure will not be significant following a year that rootworm beetle populations do not reach the threshold in that field. Where crops are rotated, rootworms are not a concern, regardless of the previous year's population of beetles.

Corn Rootworm Management

Rootworm management is important under continuous corn. Twenty-seven of the demonstration sites were continuous corn in 1992; plans are to rotate two of those fields to soybeans in 1993. Should beetle counts exceed the threshold on these fields, control can be made on the adult beetles or the larvae that feed on the roots. Fourteen of the sites used the beetle control program. All 14 had beetle counts that exceeded the threshold. The threshold number of beetles for 27,000 plants/acre corn population is two-thirds beetles/whole plant or one-third beetle/ear zone. This static threshold is calculated by dividing 18,000 by the plant population to arrive at beetles/whole plant. If only the ear zone is counted, this figure is divided by two. Eight of the sites were treated twice, five were treated once and one location was treated three times.

The remaining 13 continuous-corn fields use soil insecticides for rootworm larvae control. Cultivation-time control is more effective than planting-time control due to the time lag between planting and rootworm activity. Only three of the 13 use cultivation-time control due to various management decisions. One of the planting-time applications required a re-treatment in 1992. Two of the 13 fields had low beetle counts in 1992, indicating that rootworm insecticide will not be needed in 1993.

European Corn Borer Management

The threshold for first-generation European corn borer is a dynamic one related to live larvae counts, treatment costs, treatment effectiveness and value of corn that can be saved. Table 1 can be used to determine the threshold number of live borers per plant with 75 percent control from a chemical treatment, which is typical. Three values of corn are given, as well as two costs of treatment for several different yield potentials. Interpolation is needed for different corn prices or treatment costs as the relationships are linear. First-generation European corn borer numbers were reported on 25 sites in 1992. The threshold was exceeded on two of the sites, and two more sites were very near the threshold. Therefore, treatments were applied on four sites.

Second-generation European corn borer also has a dynamic threshold. Table 2 gives the same

Table 1: Threshold Number of Live Borers per Plant

Yield Expected (bu/ac)	160		170		180		190		200		210	
Treatment Cost ($/ac)	5	10	5	10	5	10	5	10	5	10	5	10
$2.00/ac	.42	.83	.39	.78	.37	.74	.35	.70	.33	.67	.32	.63
$2.50/ac	.33	.67	.31	.63	.30	.60	.28	.56	.27	.53	.25	.51
$3.00/ac	.27	.55	.26	.52	.25	.50	.23	.46	.22	.44	.21	.42

1. Number live borers per plant is calculated by multiplying percent shotholed
2. Assumes 75% control from treatment.

variables as seen with first-generation borer, plus the added variable of stage of plant growth. Another variable, larvae survival with no treatment is assumed to be 17.5 percent in this table. Select the stage of growth, and value of corn and find where this intersects current yield expectation and treatment cost. The resulting number is the egg masses per plants checked in percent at the break-even level of infestation. Twenty-six sites reported second-generation populations in 1992. Two sites reached the threshold and only one site was treated.

Table 2: Threshold Percent Egg Masses for Treatment of Second-Generation ECB[1] [(egg mass/plants checked) X 100]

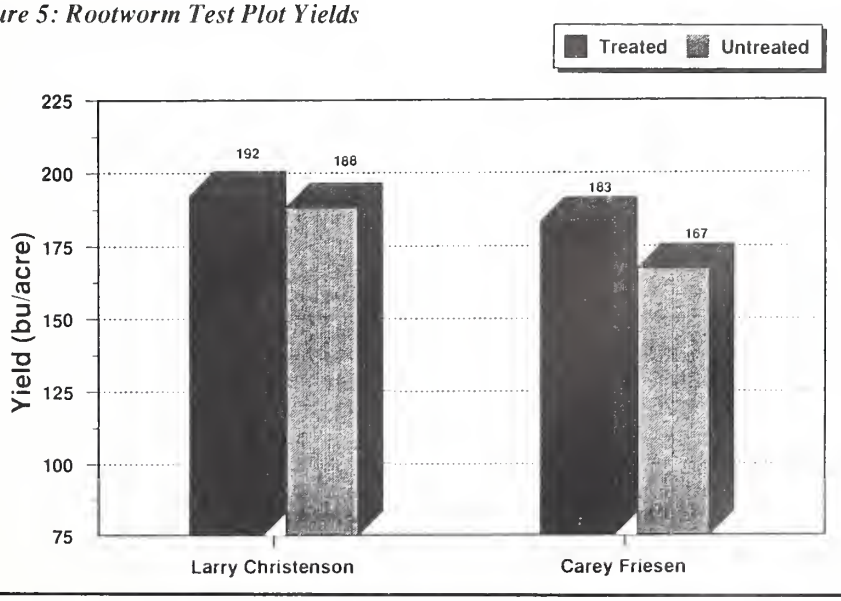
Growth Stage[2]	Yield Expectation (bu/ac)	160		170		180		190		200		210	
	Treatment Cost ($/ac)	12	8	12	8	12	8	12	8	12	8	12	8
P	$2.00/bu	30	20	28	19	26	18	25	17	24	16	23	15
	$2.50/bu	24	16	22	15	21	14	20	13	19	13	18	12
	$3.00/bu	20	13	19	12	18	12	17	11	16	10	15	10
B	$2.00/bu	38	25	36	24	34	23	32	21	30	20	29	19
	$2.50/bu	30	20	29	19	27	18	26	17	24	18	23	15
	$3.00/bu	25	17	24	16	23	15	21	14	20	14	19	13
M	$2.00/bu	44	30	43	28	39	26	37	25	35	24	34	23
	$2.50/bu	35	24	33	22	32	21	30	20	28	19	27	18
	$3.00/bu	30	20	28	19	26	18	25	17	24	16	23	15
D	$2.00/bu	67	44	63	42	59	39	56	37	53	35	51	34
	$2.50/bu	53	35	50	33	47	32	45	30	43	28	40	27
	$3.00/bu	44	30	42	28	39	26	37	25	35	24	34	23

[1]Assumes 23 eggs/mass and 17.5% larvae survival
[2]P = Pollination, B = Blister, M = Milk, D = Dough

Two sites tested corn rootworm soil insecticide treatments with field-length treated versus untreated strips. Both sites had rootworm beetle numbers in excess of the threshold during 1991, suggesting control would be needed in 1992. Yield results are shown in Figure 5.

Friesen's site was treated at planting on April 20. Christenson treated his field at first cultivation on June 8. Treatments had no apparent affect on root ratings with Friesen's averaging 2.4 and 2.5 for treated and untreated, respectively and Christenson's averaging 3.7 and 3.5.

Figure 5: Rootworm Test Plot Yields



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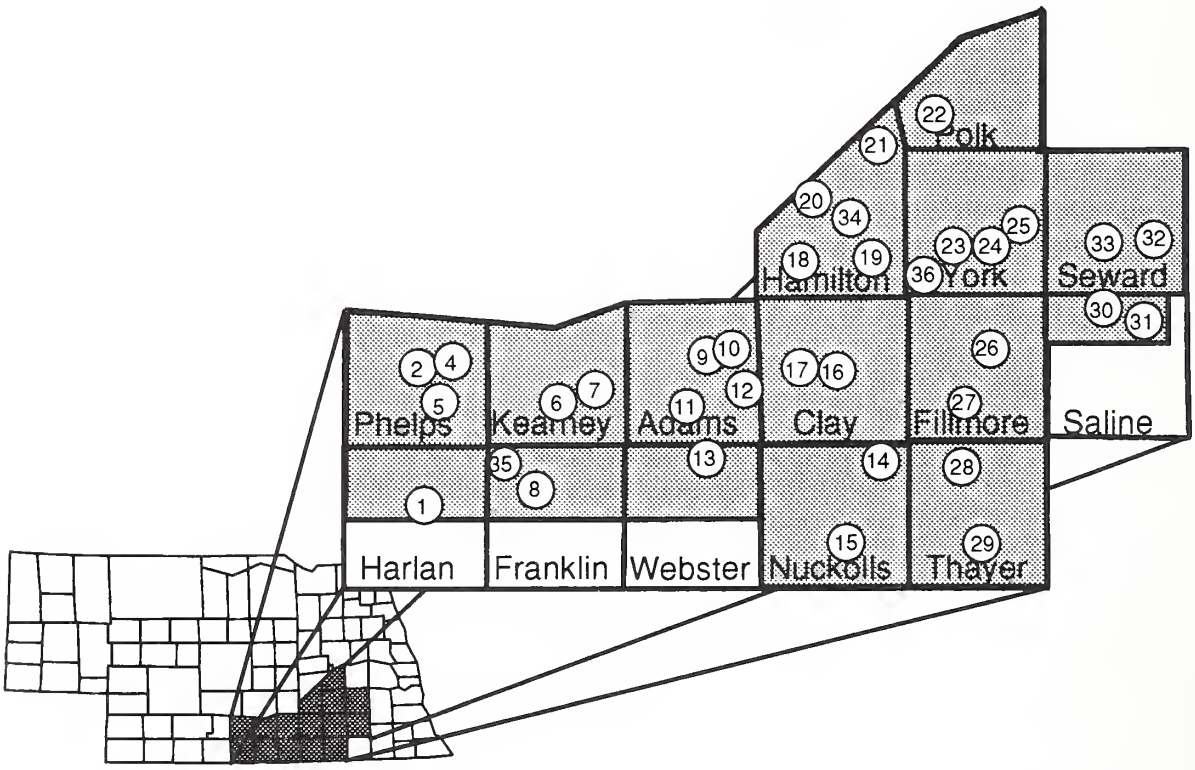
Mid-Nebraska Demonstration Project

The project staff would like to thank the following cooperators for providing demonstration sites in 1992



1 Al Hollertz
2 Chris Erickson
4 Lloyd Erickson
5 Bruce Anderson
6 Dean Casper
7 Dave Nielsen
8 John Jelken
9 Milton Ruhter
10 Myles Ramsey/ William McLeod
11 Larry Christenson
12 Bruce Bohlen
13 Kevin Karr
14 Lale Oellerich
15 Don Kottmeyer
16 Steve Yost
17 Dave Hamburger
18 Clayton Higgins
19 Carey Friesen
20 Curt Carlson
21 Joel Anderson
22 Mark Newcomer
23 Jerry Stahr-pivot
24 Jerry Stahr-gravity
25 Brad Rathje
26 Howard Lefler
27 Jim Bedlan
28 Leroy Voss
29 Effenbeck Farms
30 Keith Spohn
31 Wayne Hansen
32 Dean Rocker
33 Doug Cast
34 The Grain Place
35 Butch Ortgiesen
36 Brian Janzen

Table 3. Summary of practices and results from all of the 1992 demonstration sites.

	--Used in N rate recommendation--		--Measured during season--					
	Yield Goal	Residual Soil NO_3-N	Gross Rainfall	Gross Irrigation	Water NO_3-N Content	Gross Water N Applied	Nitrogen Rate	Yield
Plot	bu/acre	lbs/acre-4 ft	inches	in/acre	ppm	lbs/acre	lbs/acre	bu/acre
2	175	102	13.55	0.00	9.0	n/a	53 103R 153	181.0 a[1] 181.5 a 180.7 a
6	175	13	13.55	11.59	1.5	3.9	158 208R 258	138.6 b 148.4 a 153.2 a
8	160	56	13.70	8.81	9.0	20	80 130R 180	162.7 a 170.8 a 168.1 a
9	190	60	19.40	3.81	3.1	3.1	75 125R 175	188.2 a 185.1 a 193.6 a
10	170	39	12.93	28.40	5.2	33.2	118 168R 218	165.7 b 173.0 a 174.6 a
11	200	28	11.75	9.43	2.2	4.7	172 222R 272	185.3 b 194.7 a 197.3 a
12	200	66	10.47	3.49	7.4	5.8	70 120R 170	45.1 a 48.8 a 47.4 a
13	175	129	16.25	7.60	3.6	6.2	92 142R 192	176.8 b 194.0 a 196.4 a
14	180	230	23.50	1.80	3.6	2.0	0 R 50	152.7 a 147.0 a
15	160	61	17.10	0.00	n/a	n/a	95 145R 195	179.2 a 183.9 a 191.1 a
17	160	44	17.45	4.47	6.4	6.4	145 195R 245	91.4 a 89.5 a 87.9 b
18	180	23	17.75	4.05	3.3	3.0	AA 150 LIQ 150 AA 200R LIQ 200R AA 250	150.9 a 142.6 a 157.3 a 151.6 a 152.4 a
19	190	120	16.40	2.34	7.5	3.9	67 117R 167	129.2 c 144.9 b 163.7 a
20	200	139	19.35	2.15	6.9	3.3	62 112R 162	172.5 c 197.2 b 205.7 a

[1] Yields with the same letter are not significantly different at the 5 percent level of significance, using Duncan's Multiple Range Test.

AA = Anhydrous Ammonia
LIQ = liquid

Table 3. Summary of practices and results (continued).

	--Used in N rate recommendation--		--Measured during season--					
	Yield Goal	Residual Soil NO_3-N	Gross Rainfall	Gross Irrigation	Water NO_3-N Content	Gross Water N Applied	Nitrogen Rate	Yield
Plot	bu/acre	lbs/acre-4 ft	inches	in/acre	ppm	lbs/acre	lbs/acre	bu/acre
22	185	99	18.70	2.67	5.9	3.5	62 112R 142	189.8 a 196.7 a 198.7 a
23	185	21	16.05	1.50	n/a	6.8	165 215R 265	174.6 a 175.1 a 174.2 a
24	185	99	19.29	1.46	0.9	1.6	157 207R 257	173.3 a 174.4 a 173.0 a
25	170	47	18.55	2.50	0.9	6.8	118 168R 218	187.5 a 184.0 a 188.0 a
26	180	52	16.05	2.43	n/a	n/a	87 137R 187	205.4 a 206.2 a 207.8 a
27	180	230	18.25	0.00	2.5	0.0	70 120R 170	150.8 b 159.0 a 159.7 a
28	160	52	22.25	4.81	6.3	6.8	101 151R 201	105.2 c 135.3 b 163.3 a
29	185	63	16.05	2.33	5.0	2.6	82 132R 182	130.5 a 123.7 b 133.3 a
30	200	194	16.05	2.15	1.3	0.6	65 115R 180	182.3 b 202.0 a 214.6 a
31	185	122	16.65	0.00	1.9	0.0	51 101R 151	99.4 c 137.2 b 160.5 a
32	180	72	17.95	3.06	7.7	5.3	92 142R 192	159.1 b 160.8 b 173.0 a
33	185	142	19.45	0.00	17.6	0.0	0 50R 100	89.3 c 134.2 b 152.6 a
35	180	62	13.95	20.95	n/a	n/a	111 161R 211	185.5 b 194.8 a 193.1 a
36	170	37	18.75	n/a	n/a	n/a	130 180R 230	174.6 a 178.5 a 177.4 a

[1] Yields with the same letter are not significantly different at the 5 percent level of significance, using Duncan's Multiple Range Test.

AA = Anhydrous Ammonia
LIQ = liquid

Individual Demonstration Plot Data Summaries

Please note:

Each site is unique--not all practices are demonstrated at each site. The general format includes General Information, Nitrogen Management, Irrigation Management, Integrated Pest Management, and Vadose Zone (area between roots and water table) Nitrate information. Some sites will have information on all of these categories, while others may not, depending upon the individual practices of each cooperator.

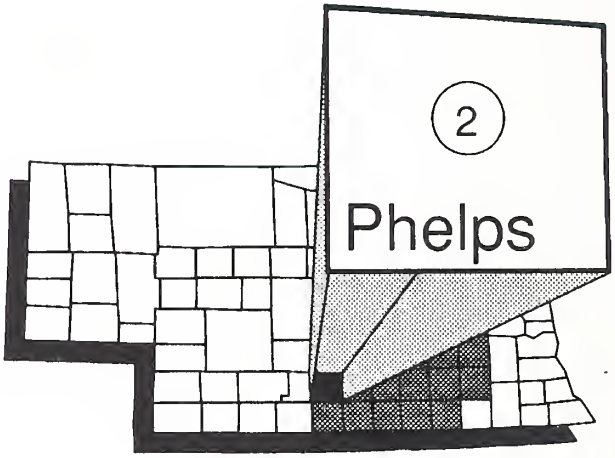
Site 2

Chris Erickson - Phelps County

General Information:

Site 2 is located on the Chris Erickson farm three miles east, two miles north and ¼ mile east of Holdrege. The field has been in continuous corn production. The soil type is a Holdrege silt loam with a 0-1 percent slope.

Chris shredded stalks and applied anhydrous NH_3 down the old row. Pioneer 3394 was ridge-planted on April 20 in 36-inch rows. The harvest population was 24,250 plants/acre.



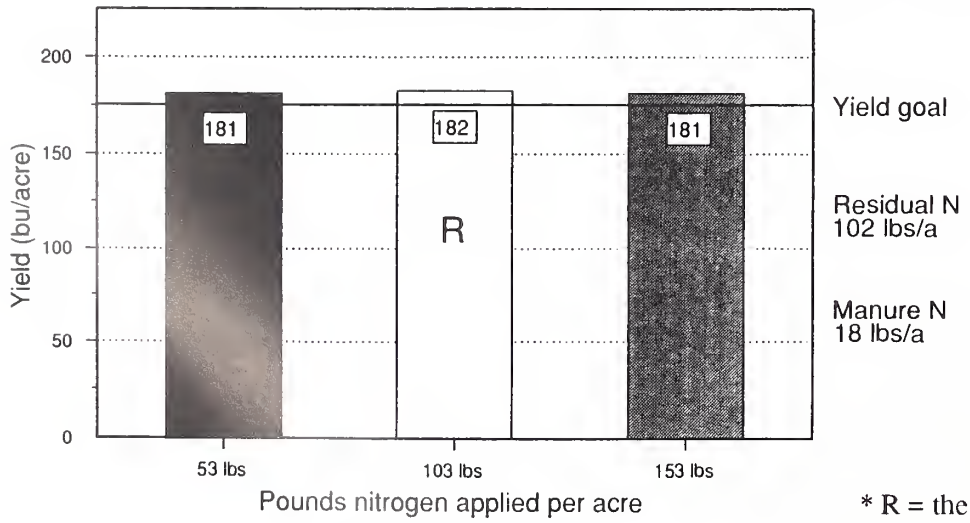
Nitrogen Management:

Chris included nitrogen rate comparison plots in this field. The plots were 12 rows wide, 1,335 feet long and replicated four times. The treatments are shown in the graph below. Chris' yields were higher in 1992 because he changed to a different field. Cattle manure was applied with a pull spreader in January, February, and March, at a rate of four tons per acre. Anhydrous ammonia was the nitrogen source and was applied on April 7, 1992.

The recommended rate of nitrogen was determined using a 175-bushel yield goal. The rate applied was calculated by subtracting soil, manure, and irrigation water nitrogen from the nitrogen required for 175 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation water accounted for 7.8 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water.

Yield Results

Yield goal: 175 bu/acre N required for yield goal: 103 lbs/acre



* R = the UN-L recommended rate

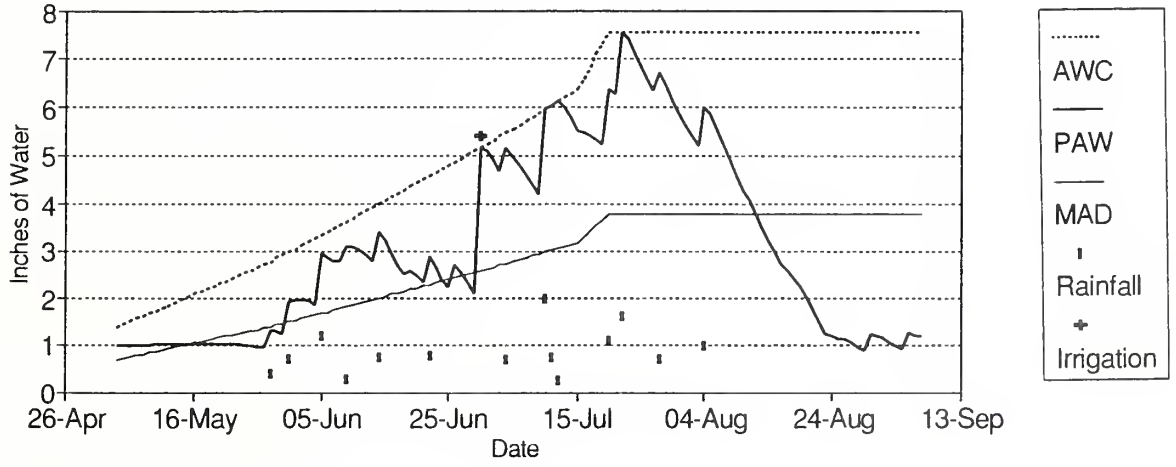
General Fertility	
pH	6.4
OM	2.9%
P	25 ppm
K	466 ppm
Zn	2.12 ppm

Treatment	-50	Rec	+50
N rate (lbs/acre)	53	103	153
Yield avg. (bu/acre)	181	182	181
Test wt. (lbs/bu)	57	57	57
Moisture (%)	17.2	17.0	17.4

Irrigation Management:

This site was gravity irrigated, watering alternate (every other) furrows. Irrigation was scheduled in 1992 using the appearance and feel and the checkbook methods. The field received 13.55 inches of rainfall between May 1 and September 9, 1992, and 5.41 inches of water were applied in two irrigations.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occured. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



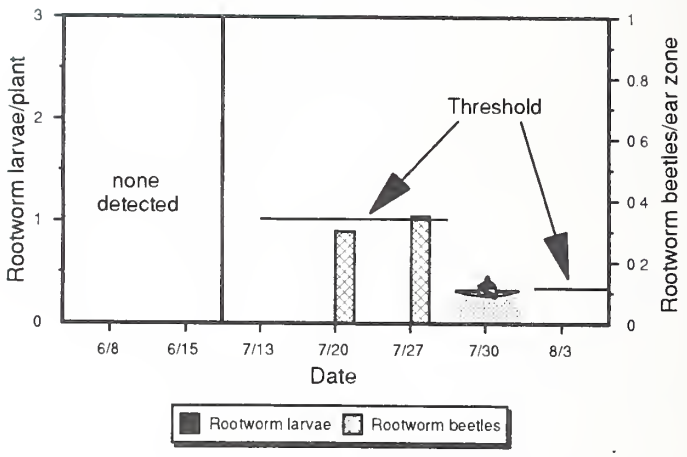
Integrated Pest Management:

Chris banded three pints of Lariat at planting. The field was cultivated on May 24 and hilled on June 8.

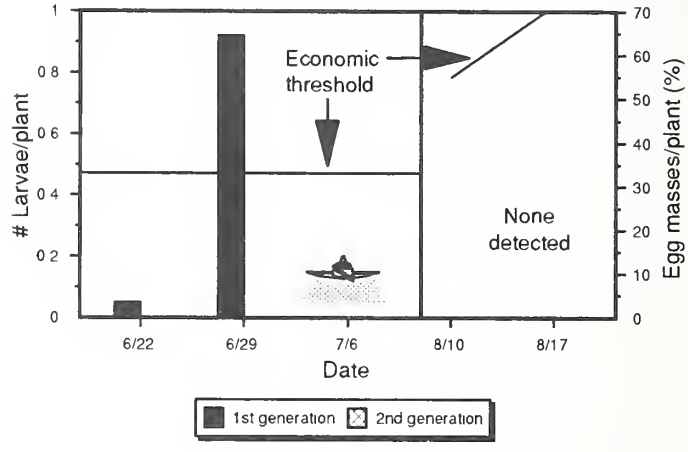
Rootworm larvae were managed with the beetle control program. Soil insecticide was not used. The field was treated with 1.5 pints of Penncap-M on July 30.

First-generation European corn borer exceeded the threshold on June 29. The field was treated with an aerial application of Dyfonate II at the five-pound rate on July 6. Second-generation European corn borer never reached the threshold for treatment.

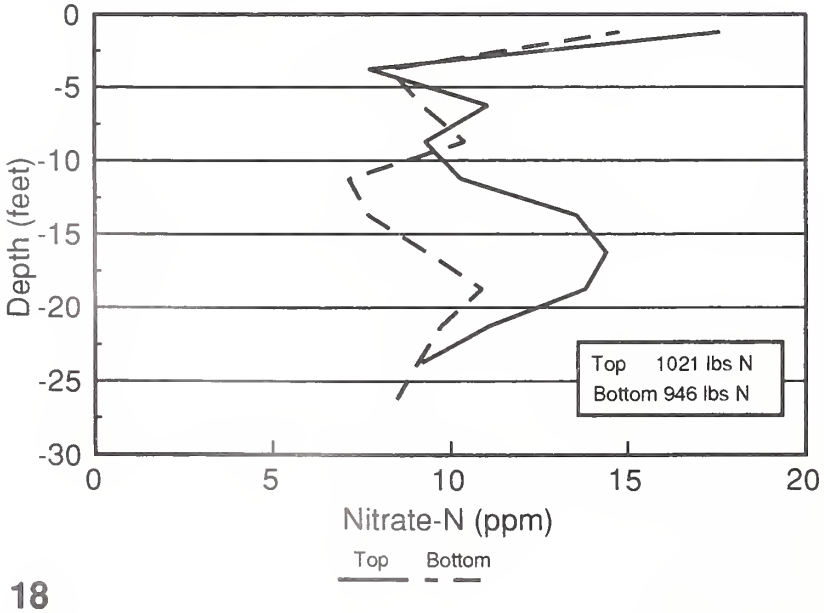
Rootworm Management



Corn Borer Management



Vadose Zone Nitrate



The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

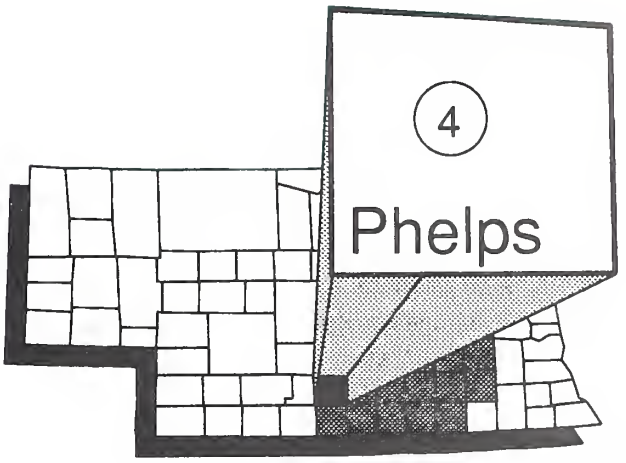
Site 4

Lloyd Erickson - Phelps County

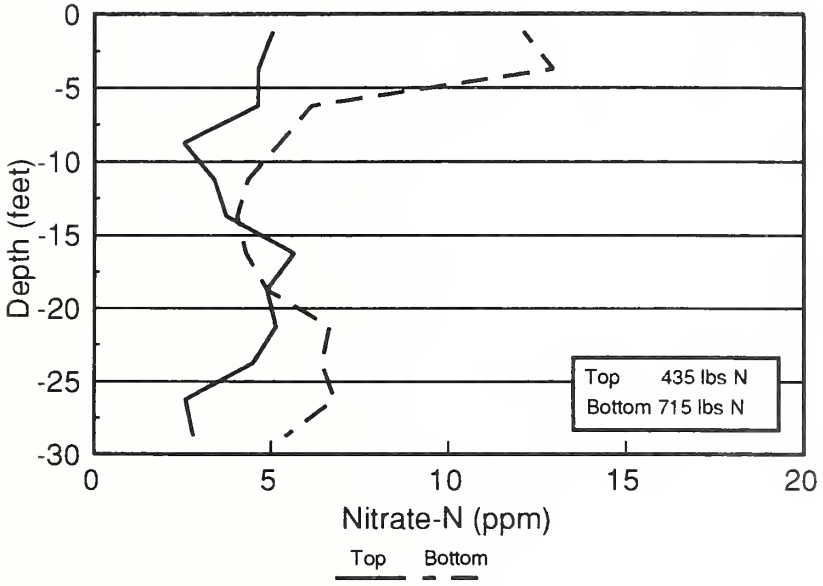
General Information:

Site 4 is located on the Lloyd Erickson farm three miles north and ¼ mile east of Holdrege in Phelps County. This gravity-irrigated farm has been in continuous corn production. The soil type is a Holdrege silt loam with a 0-1 percent slope.

Lloyd applied anhydrous ammonia prior to planting. The corn was completely froze out due to a late May frost. He then made the decision to replant the entire field to milo. As a result, no information was collected from this site.



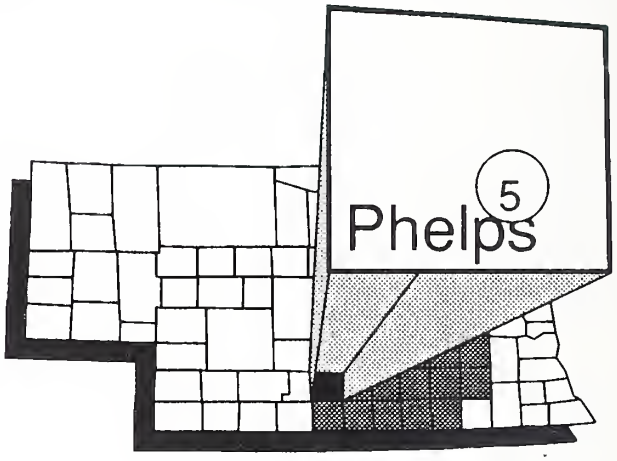
Vadose Zone Nitrate



The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

Site 5

Bruce Anderson - Phelps County



General Information:

This field is located one mile north and one mile east of Sacremento in Phelps County. The soil type is a Holdrege silt loam with a 1-3 percent slope.

Preplant operations included shredding the stalks and disking twice. Phosphorus and zinc were broadcast-applied after the first disking and anhydrous NH_3 was knifed in. Golden Harvest 2525 was planted on April 24 in 36-inch rows.

Nitrogen Management:

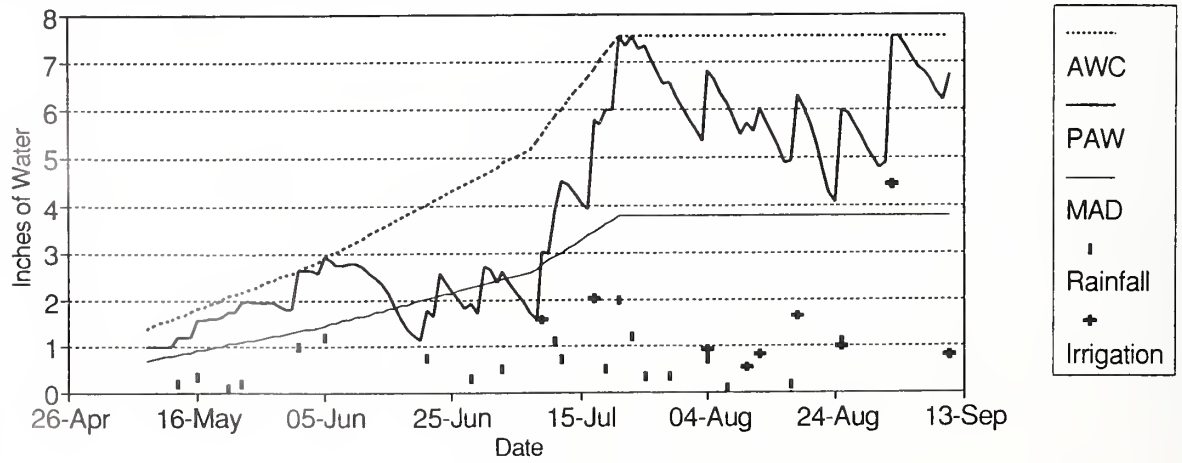
Bruce did not have nitrogen rate comparison plots in this field. Forty-five pounds of dry phosphorous and two pounds of zinc were broadcast-applied on April 2, 1992. Anhydrous ammonia was knifed in at a rate of 167 pounds/acre on April 7, 1992.

The recommended rate of nitrogen was determined using a 180-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation water nitrogen from the nitrogen required for 180 bushels of corn. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water.

Irrigation Management:

This site was gravity irrigated with a surge valve, watering alternate (every other) furrows. Irrigation was secheduled in 1992 using moisture blocks. The field received 13.70 inches of rainfall between May 1 and September 9, 1992, and 13.77 inches of water was applied in nine irrigations.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.

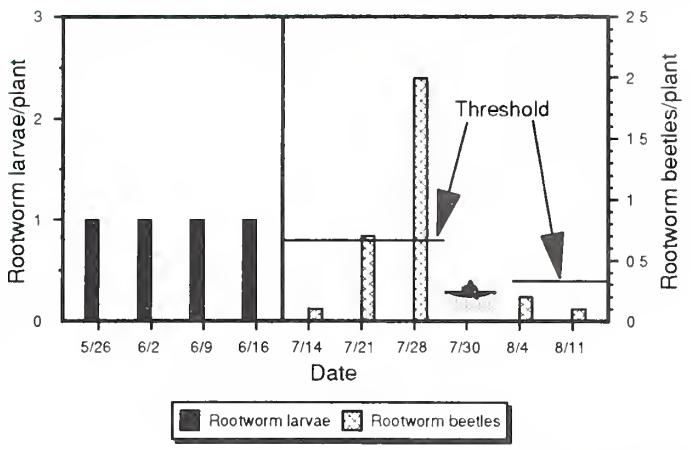


Integrated Pest Management:

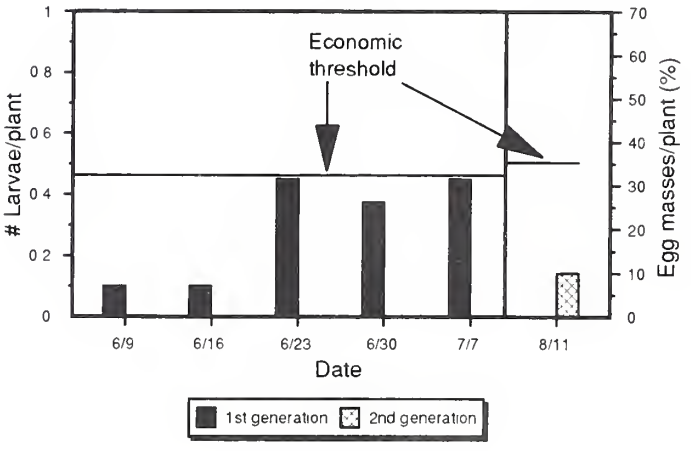
Rootworm larvae were managed with the beetle control program. Soil insecticide was not used. The threshold for rootworm beetles was reached on July 21 with .7 beetles/plant. The field was sprayed with one pint of Penncap-M on July 30.

First-generation European corn borer neared the threshold on June 23. Bruce chose not to treat at this level. Second-generation European corn borer did not reach threshold levels.

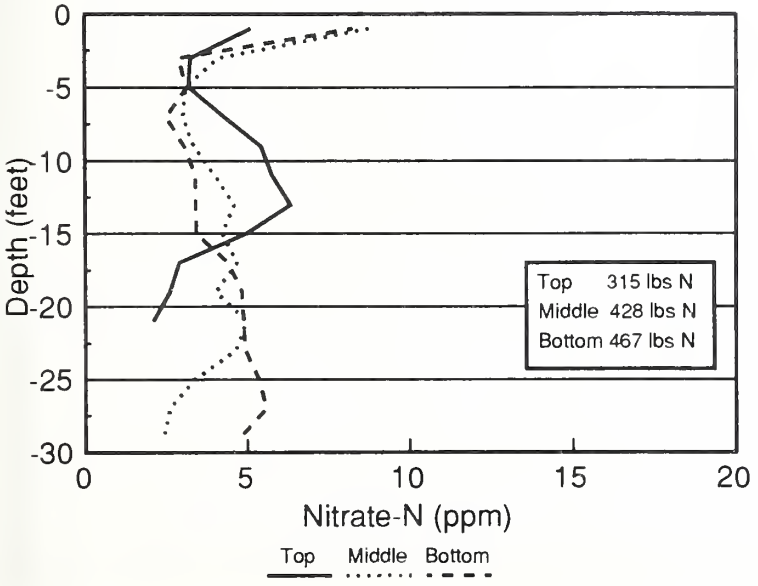
Rootworm Management



Corn Borer Management



Vadose Zone Nitrate



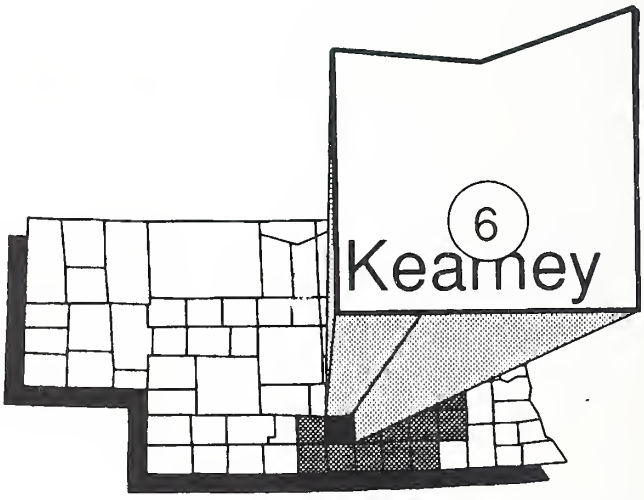
The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

Site 6

Dean Casper - Kearney County

General Information:

Site 6 is located on the Dean Casper farm five miles south, three miles west, and ¾ mile south of Minden in Kearney County. This site has been in continuous corn. The soil type is a Holdrege silt loam with a 0-1 percent slope.



The only field preparation prior to planting was the shredding of stalks and anhydrous NH_3 that was applied down the old row. Hoegemeyer 2680 was ridge-planted on April 27 in 36-inch rows. Harvest population was 25,750 plants/acre.

Nitrogen Management:

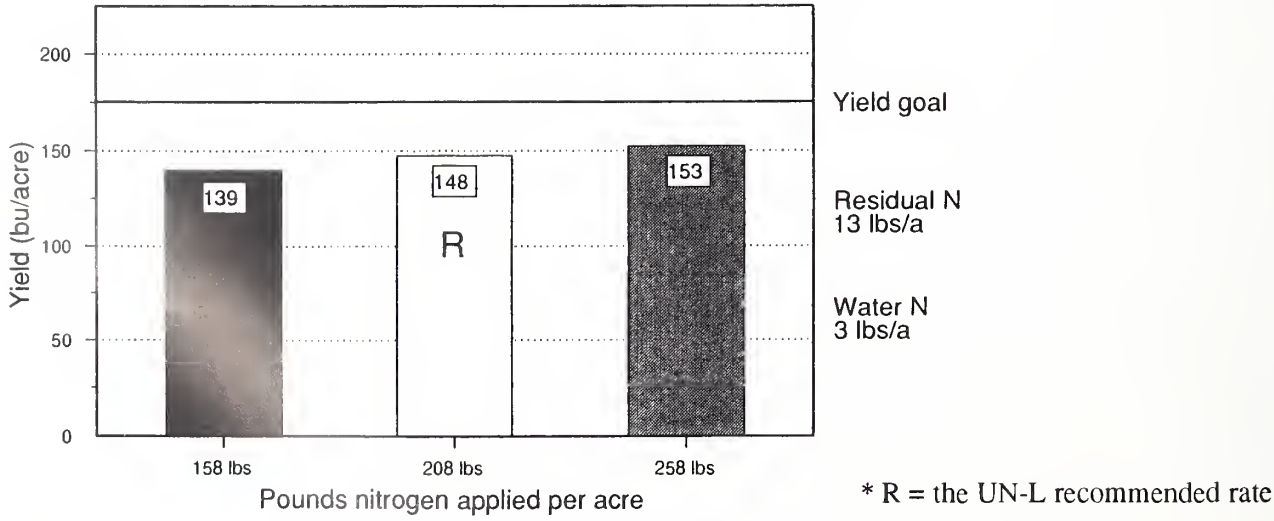
Dean included nitrogen rate comparison plots in this field. The plots were six rows wide, 1,254 feet long and replicated four times. The treatments are shown in the graph below. Dean's yields were lower in 1992 due to hail received on July 8, 1992. Anhydrous ammonia was the nitrogen source and was applied on April 15, 1992.

The recommended rate of nitrogen was determined using a 175-bushel yield goal. The rate to be applied was calculated by subtracting soil and irrigation water nitrogen from the nitrogen required for 175 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation water accounted for 1.5 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water.

Yield Results

Yield goal: 175 bu/acre

N required for yield goal: 208 lbs/acre



* R = the UN-L recommended rate

General Fertility	
pH	7.2
OM	2.4%
P	44 ppm
K	611 ppm
Zn	1.28 ppm

Treatment	-50	Rec	+50
N rate (lbs/acre)	158	208	258
Yield avg. (bu/acre)	139	148	153
Test wt. (lbs/bu)	55	55	55
Moisture (%)	20.7	20.3	20.7

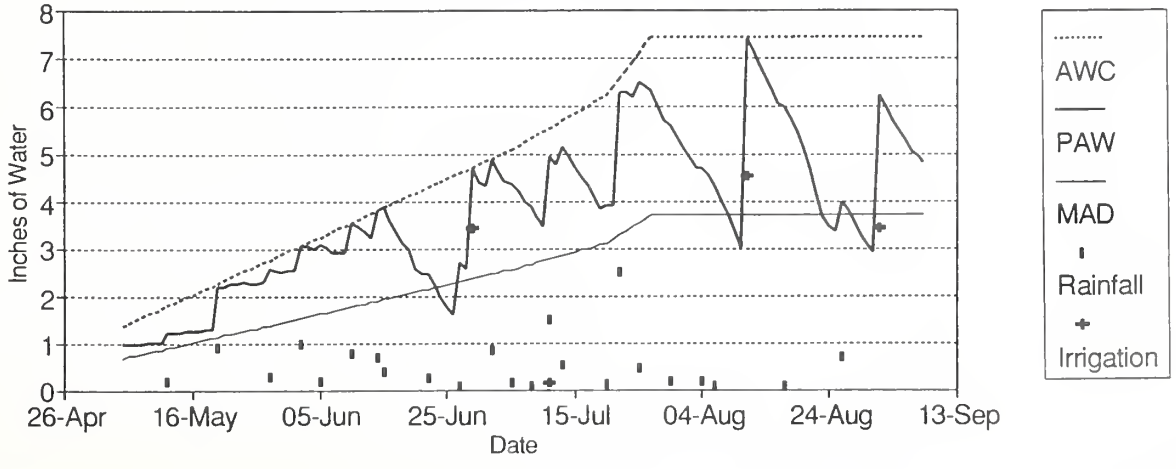
Year		Water N (lbs/acre)	Soil Res-N (lbs/acre)	N Applied (lbs/acre)	Yield (bu/acre)	3-Year Average	
	-50			75	148		
1990	**Rec**		**110**	**125**	**165**		
	+50			175	173		
	-50	2	25	148	140		
1991	**Rec**		**33**	**198**	**160**	Avg N Applied	Avg Yield
	+50		29	248	172		
	-50	3	10	158	139	127	142
1992*	**Rec**		**13**	**208**	**148**	**177**	**158**
	+50		14	258	153	227	166

** Hail reduced yields in 1992.*

Irrigation Management:

This site was gravity irrigated with a surge valve, watering every furrow. Irrigation was scheduled in 1992 using the appearance and feel and the checkbook methods. The field received 13.55 inches of rainfall between May 1 and September 9, 1992, and 11.59 inches of water were applied in four irrigations.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



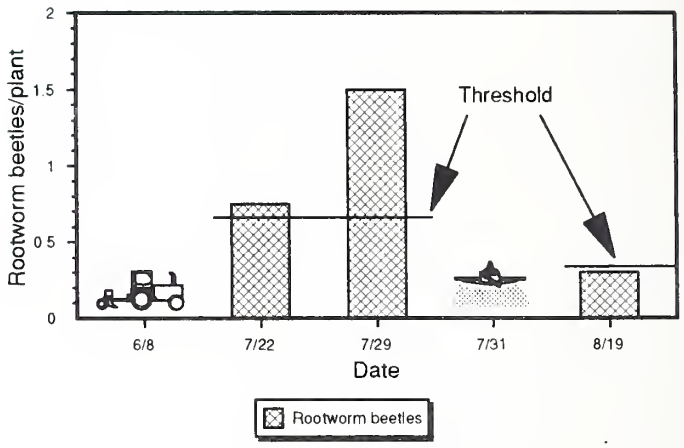
Integrated Pest Management:

Rootworm larvae were controlled with 5.2 pounds of Furadan 15G at cultivation time on June 8. Rootworm beetles exceeded the threshold on July 22 at .75 beetles/plant. This indicated that there is a chance that rootworm larvae will cause damage that exceeds the value of treatment in 1993 if corn is planted.

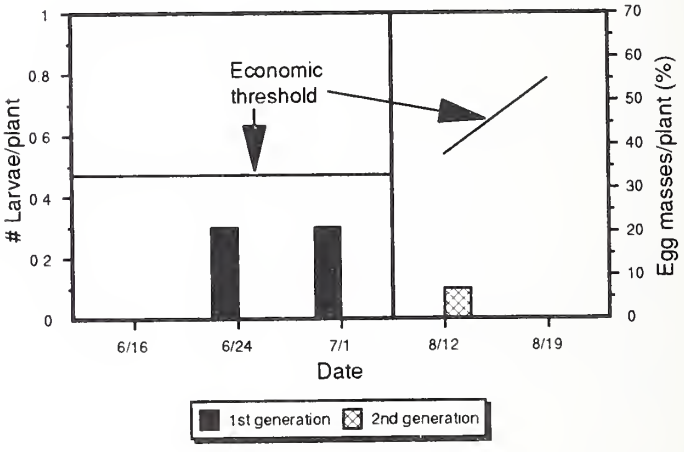
Treatment thresholds were not exceeded for either first- or second-generation European corn borer.

Western bean cutworm was at the 10 percent level on July 29 with 7 percent armyworm. The field was sprayed with two pints of Penncap-M on July 31. Because of the re-infestation of rootworm beetles to a marginal level Dean will have to decide whether or not to treat for rootworm larvae in 1993.

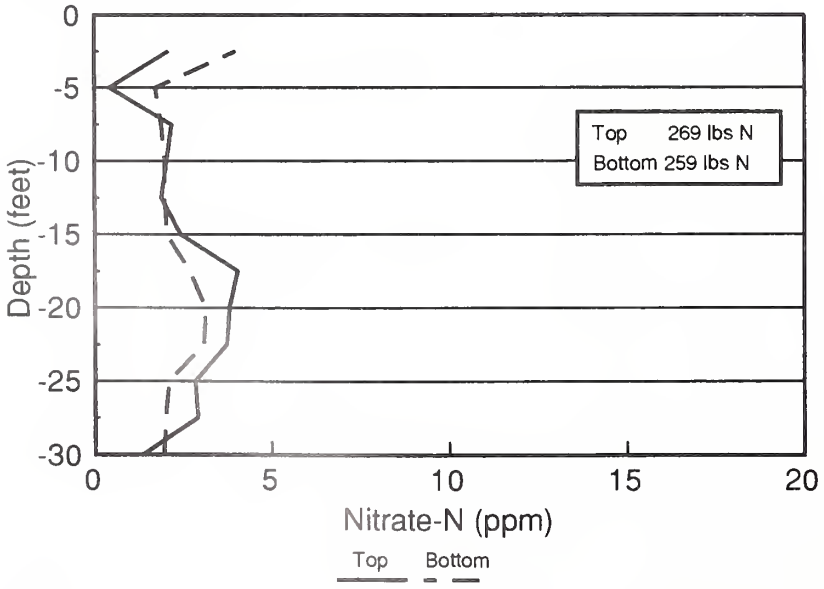
Rootworm Management



Corn Borer Management



Vadose Zone Nitrate



The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

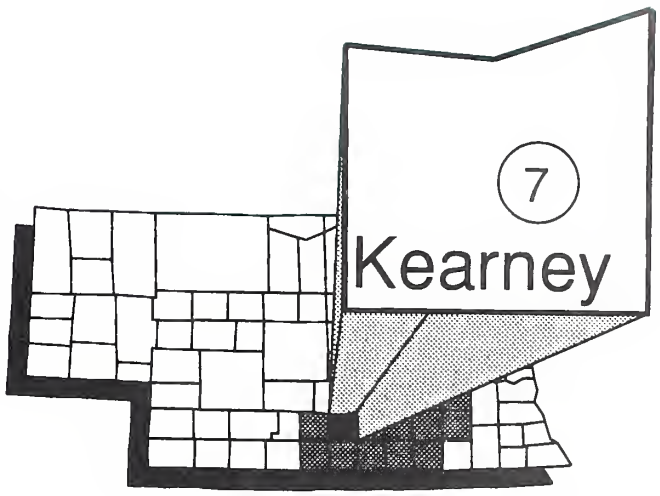
Site 7

Dave Nielsen - Kearney County

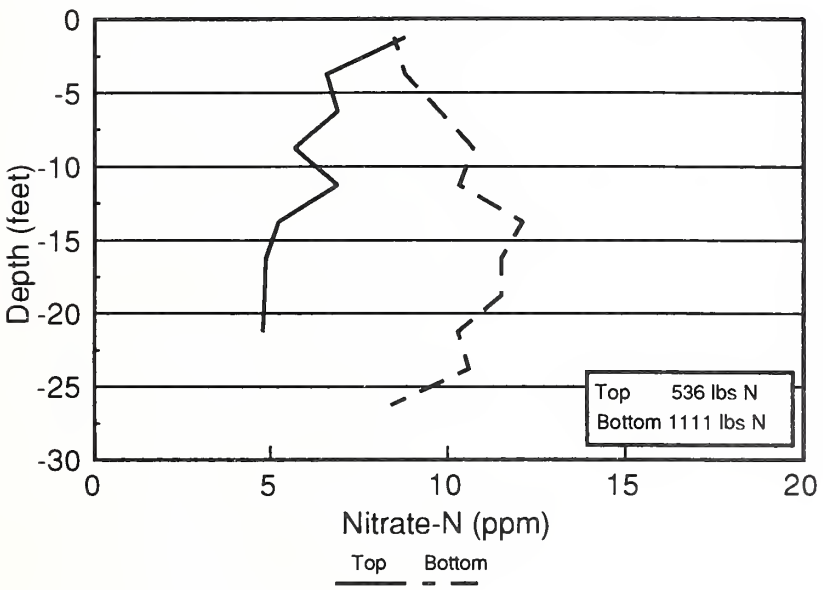
General Information:

Site 7 is located on the David Nielsen farm one mile south and ½ mile east of Minden in Kearney County. This gravity-irrigated farm has been in continuous corn production. The soil type is a Holdrege silt loam with a 0-1 percent slope.

David applied anhydrous ammonia prior to planting. The corn was completely frozen out due to a late May frost. He then made the decision to replant the field to corn and milo. As a result, no irrigation information was collected.



Vadose Zone Nitrate



The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

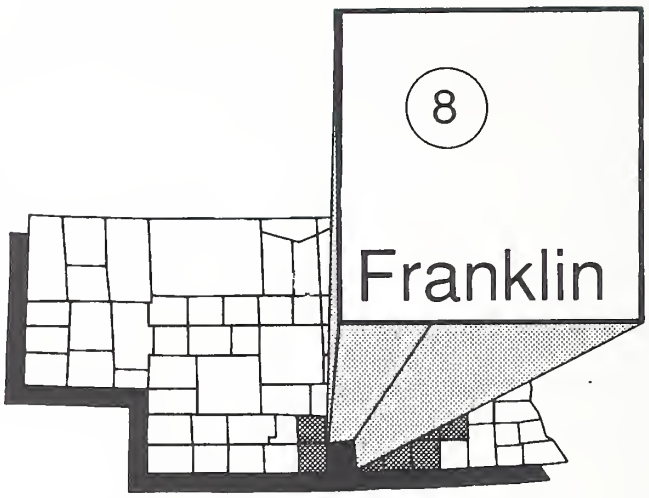
Site 8

John Jelken - Franklin County

General Information:

Site 8 is located on the John Jelken farm five miles south, and two miles west of the Hildreth corner on Highway 4 in Franklin County. This field has been in continuous corn production. The soil type is a Holdrege silt loam with a 0-1 percent slope.

John's only field practice prior to planting was to shred stalks. He ridge-planted NC+ 5891 in 36-inch rows on April 29 and applied a liquid fertilizer. Harvest population was 23,200 plants/acre.



Nitrogen Management:

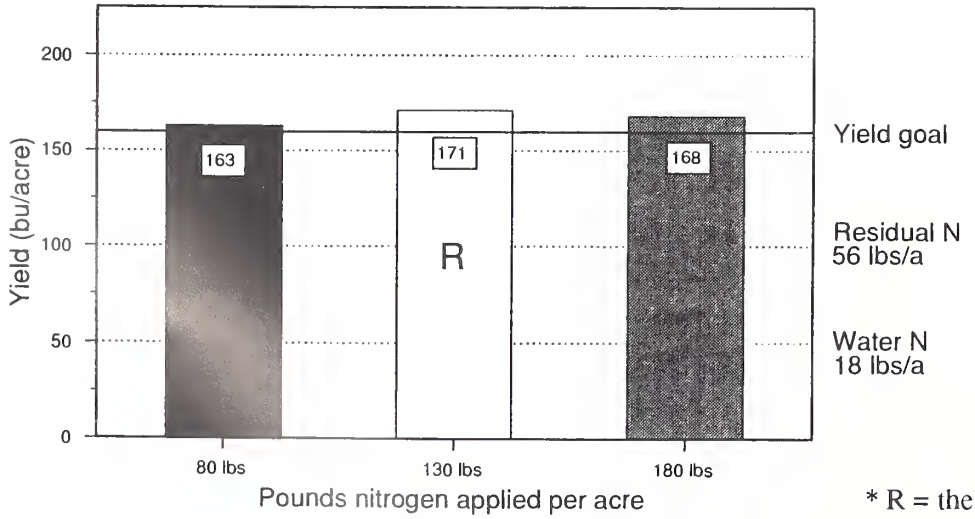
John included nitrogen rate comparison plots in this field. The plots were 20 rows wide, 711 feet long and replicated four times. The treatments are shown in the graph below. John's yields were lower in 1992 but still exceed the yield goal. Nitrogen was broadcast with a floater using 28-0-0 on May 1, 1992.

The recommended rate of nitrogen was determined using a 160-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation water nitrogen from the nitrogen required for 160 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation water accounted for 9.0 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water.

Yield Results

Yield goal: 160 bu/acre

N required for yield goal: 130 lbs/acre



* R = the UN-L recommended rate

General Fertility	
pH	5.7
OM	3.0%
P	41 ppm
K	587 ppm
Zn	3.65 ppm

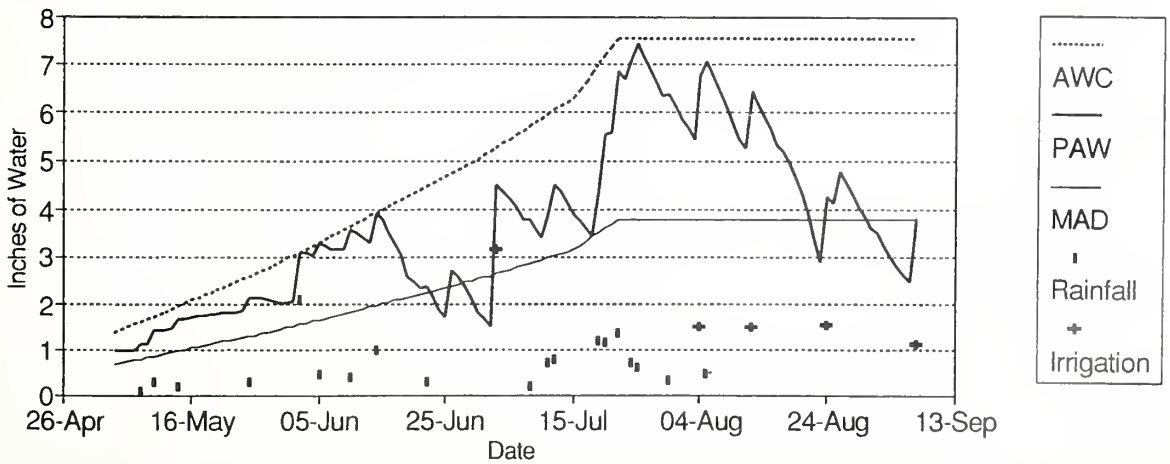
Treatment	-50	Rec	+50
N rate (lbs/acre)	80	130	180
Yield avg. (bu/acre)	163	171	168
Test wt. (lbs/bu)	55	55	55
Moisture (%)	20.7	20.3	20.7

Year		Water N (lbs/acre)	Soil Res-N (lbs/acre)	N Applied (lbs/acre)	Yield (bu/acre)	3-Year Average	
	-50			120	184		
1990	**Rec**		**47**	**170**	**186**		
	+50			220	176		
	-50	18	34	100	186		
1991	**Rec**		**49**	**150**	**182**	Avg N Applied	Avg Yield
	+50		64	200	188		
	-50	18	54	80	163	100	178
1992	**Rec**		**64**	**130**	**171**	**150**	**180**
	+50		49	180	168	200	177

Irrigation Management:

This site was gravity irrigated with a surge valve, watering every furrow. Irrigation was scheduled in 1992 using the appearance and feel and the checkbook methods. Soil moisture blocks were also used to determine moisture status. The field received 13.70 inches of rainfall between May 1 and September 9, 1992, and 8.81 inches of water were applied in five irrigations.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.

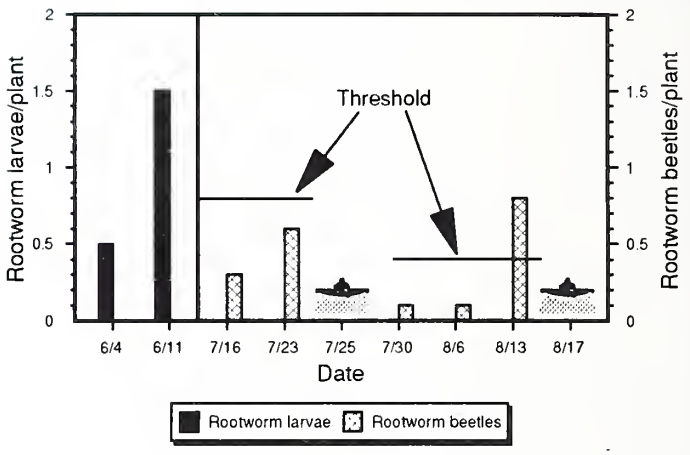


Integrated Pest Management:

John used the rootworm beetle control program. The beetle threshold was neared on July 23 and western bean cutworm reached 10 percent. He treated the field on July 25 with two pints of Penncap-M. Beetle numbers rose above the threshold on August 13 and the field was re-treated with Penncap-M on August 17.

European corn borer did not reach the threshold for either first or second generation.

Rootworm Management

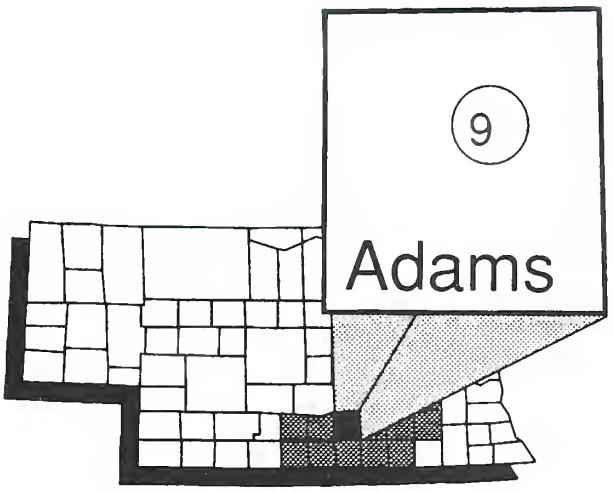


Site 9

Milton Ruhter - Adams County

General Information:

Site 9 is located on the Milton Ruhter farm 2½ miles south of Prosser in Adams County. A corn/soybean rotation has been the practice on this site. The soil type is a Hord silt loam with a 0-1 percent slope.



Since Milt ridge-plants corn into the soybean stubble, there were no field operations prior to planting. Ohlde 220 was planted in 36-inch rows on April 25 and banded with an application of 28-0-0 liquid nitrogen. Additional 28-0-0 was applied at hilling time. Harvest population was 25,000 plants/acre.

Nitrogen Management:

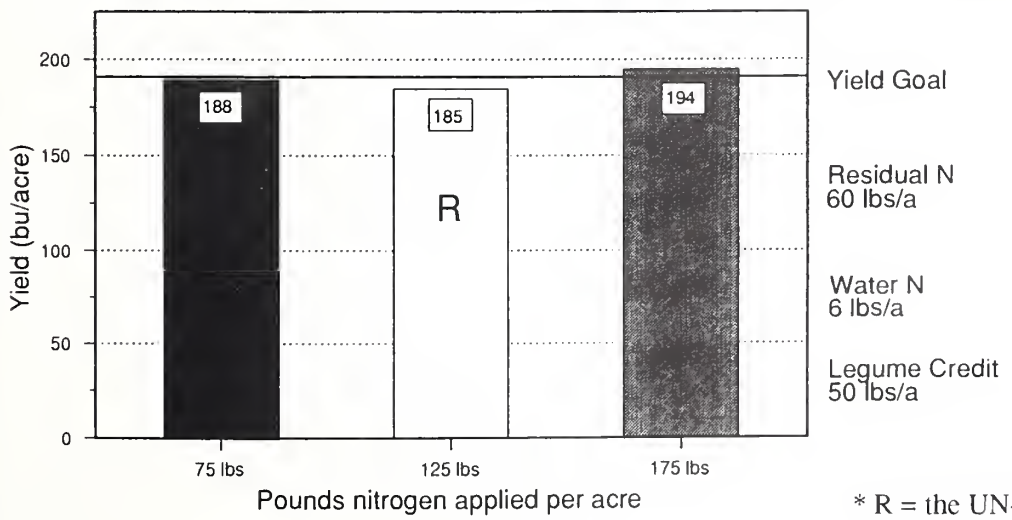
Milton included nitrogen rate comparison plots in this field. The plots were eight rows wide, 1,864 feet long and replicated four times. The treatments are shown in the graph below. Milt's yields were good in 1992 despite receiving 16 percent hail damage on July 27, 1992. Nitrogen was split-applied using 28-0-0. Ten gallons were applied in a band at planting. Milton applied 31.5 gallons at hilling on June 18, 1992.

The recommended rate of nitrogen was determined using a 190-bushel yield goal. The rate applied was calculated by subtracting soil, manure, and irrigation water nitrogen from the nitrogen required for 190 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation water accounted for 3.1 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water.

Yield Results

Yield goal: 190 bu/acre

N required for yield goal: 125 lbs/acre



* R = the UN-L recommended rate

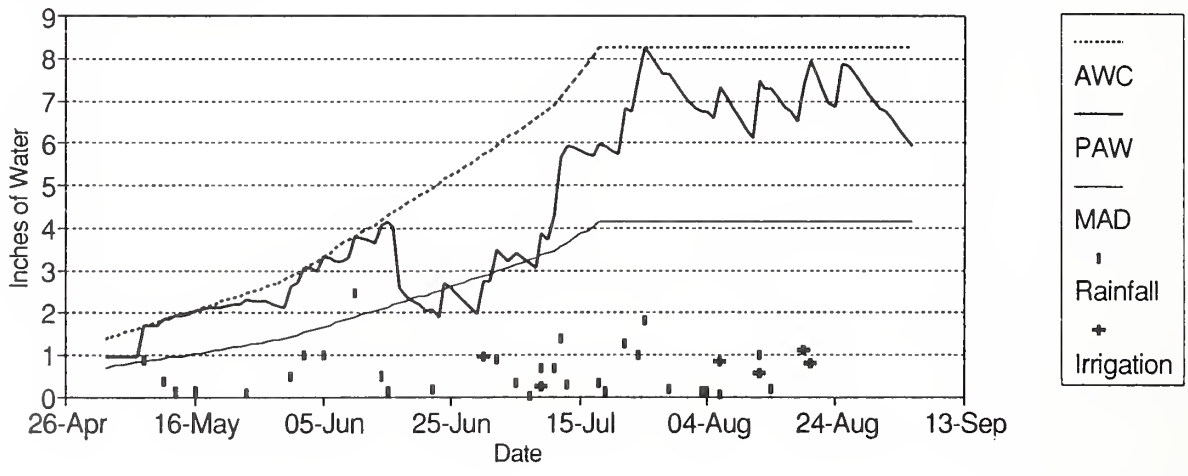
General Fertility	
pH	6.1
OM	2.4%
P	43 ppm
K	438 ppm
Zn	2.24 ppm

Treatment	-50	Rec	+50
N rate (lbs/acre)	75	125	175
Yield avg. (bu/acre)	188	185	194
Test wt. (lbs/bu)	55	55	54
Moisture (%)	18.1	18.4	18.4

Irrigation Management:

This site was gravity irrigated, watering every furrow. Irrigation was scheduled in 1992 using the appearance and feel and the checkbook methods. Soil moisture blocks were also used to determine moisture status. The field received 19.40 inches of rainfall between May 1 and September 9, 1992 and 4.1 inches of water were applied in six irrigations.

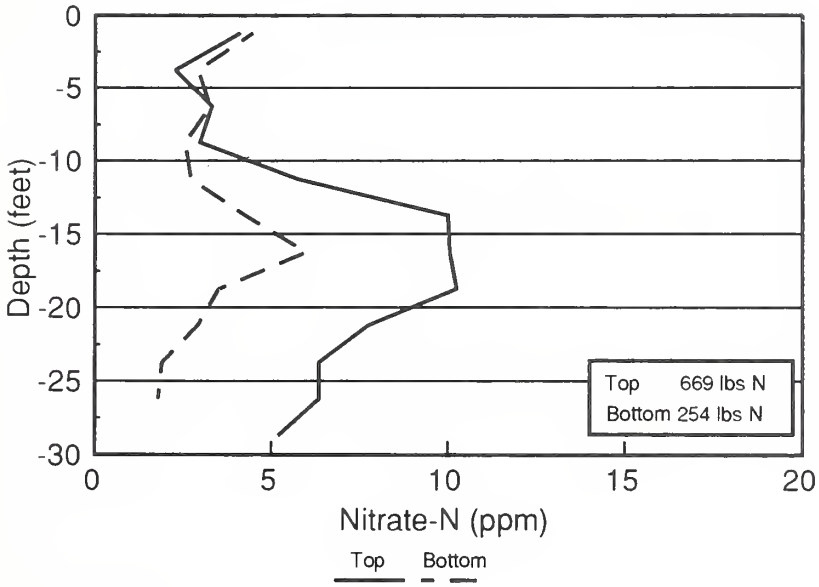
The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



Integrated Pest Management:

Milton did not use any herbicide on this field in 1992 since he rotates corn and soybeans. The field was not cultivated due to weather. He hilled the field on June 18. The rotation prevents corn rootworms from laying their eggs in the field during the year soybeans are grown. Therefore, there were no rootworm larvae in the field and no insecticides were used.

Vadose Zone Nitrate



The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

Variable Rate Nitrogen Fertilization With Furrow Irrigation - Milton Ruhter Farm

Recent advances in technology have allowed the summary of information about field variability into a quantified format which can be used to control various field operations automatically. The adjustments which some producers have made "by the seat of their pants" can now be controlled by computers. Considerable attention has been given to this technology (sometimes called farming-by-soils or farming-by-the-foot) in popular farm publications over the last couple of years. Much of the interest and technology to date has been oriented toward the application of non-mobile nutrients, such as phosphorus and potassium. Adaption of this technology to anhydrous ammonia application equipment has created an interest in the technology because of its potential impact on groundwater quality. Additionally, the inherent variability found in soil nitrate levels with furrow irrigation makes the technology attractive in Nebraska.

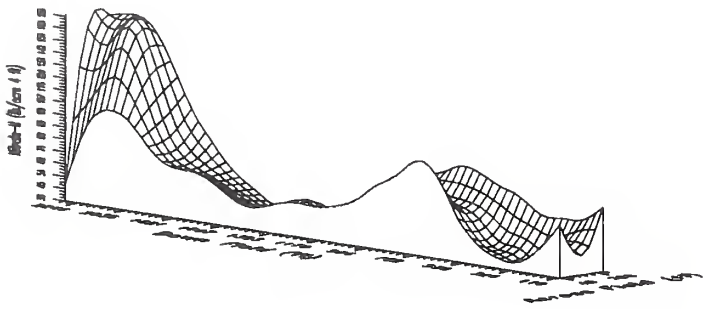


Figure 1. Soil residual nitrate-N to four feet, Dean Rocker farm, spring, 1992.

Two MNWQDP sites were sampled in 1992 to demonstrate this new technology. Soil samples were collected to a depth of four feet on a 200-foot grid. Maps of nitrate levels in these fields are shown in Figures 1 and 2.

Figure 1 illustrates the distribution of residual nitrate in a field in Seward county on the Dean Rocker farm, showing the effect of the irrigation water infiltration profile on residual nitrate. Residual nitrate generally increases with distance from the irrigation pipe. The increase in concentration at a distance of 700-900 feet, followed by a decrease, is likely related to other variables which were not mapped, such as elevation, clay content, compaction, differences in drainage, etc. The highest residual nitrogen levels (in the range of 120-160 pounds nitrogen/acre in four feet) were found at the farthest downstream points.

Figure 2 illustrates the distribution of residual nitrate-nitrogen at the Milton Ruhter farm in Adams county. Nitrate-nitrogen levels at four feet ranged from approximately 15 pounds/acre to over 230 pounds/acre in this field. The site was relatively complex regarding how it was managed for irrigation, which explains some of the trends in residual nitrate. The field had a draw running across it approximately two-thirds of the distance from the "upper" end; gated irrigation pipe was laid at both ends of the field, and water ran towards the draw. Residual nitrate levels were lowest at both ends of the field, and highest in the vicinity of the draw. Besides being the low point of the field, part of the draw area was also mapped as a Butler soil— which is less well-drained than the majority of the field, mapped as a Hord soil. An area of elevated nitrate was noted at one corner of the "upper" end of the field. This area was significantly cut and filled when the field was leveled for irrigation. The area was poorly drained, and generally observed by the cooperator to be less productive than the rest of the field. Both the corner of the field and the draw area apparently had a lower yield potential than the rest of the field, and consequently used less of the applied fertilizer nitrogen. It is likely that the high areas of

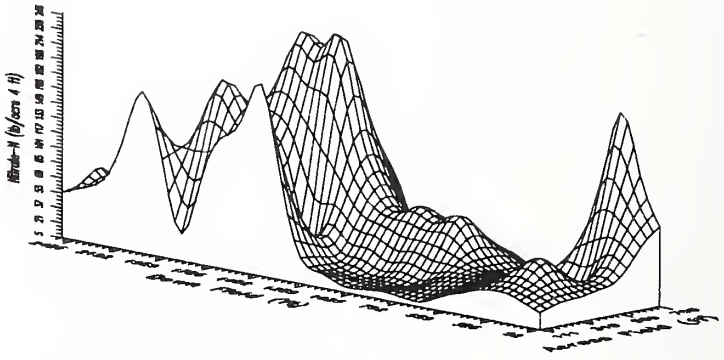


Figure 2. Soil residual nitrate-N to four feet, Milton Ruhter farm, spring, 1992.

residual nitrate are due to differences in irrigation water infiltration as well as yield potential of the soil.

A variable rate anhydrous ammonia applicator was used at the Ruhter farm to variably apply nitrogen according to the soil nitrate level. (The applicator was used at the Dean Rocker farm, but the computer program was not properly calibrated and excessive rates of nitrogen were applied.) The cooperator applied 30 pounds nitrogen/acre as starter. The balance of the nitrogen required for an expected yield of 180 bushels/acre was applied as sidedressed ammonia, with rates ranging from zero to 185 pounds nitrogen/acre, for total amounts of nitrogen in the field ranging from 30 to 215 pounds nitrogen/acre. Four treatments were applied in a randomized complete block design with six replications. The four treatments were: 1) variable nitrogen rate, 2) uniform UNL recommended nitrogen rate (180 pounds nitrogen/acre), 3) <55 pounds/acre rate (125 pounds nitrogen/acre) and 4) a >35 pounds/acre rate (215 pounds nitrogen/acre). Each treatment was applied to field-length strips that were eight rows wide.

A research combine capable of measuring yield on-the-go from Kansas State University was used to harvest the strips. Spatial yield data from these measurements is not yet available. However, yield from each strip was measured with a weigh wagon. Average yields from the four treatments are shown in Table 1.

Grain yields on the Rhuter Farm were reduced at the <55 pounds nitrogen/acre rate, but were the same statistically with the other three treatments. Figure 3 illustrates the trend of grain yield across the field, with vertical bars indicating yield for individual strips. Grain yield was evidently influenced somewhat by the position of the strip in the field, with yield in the fourth through 10th strips somewhat lower than other strips no matter what the nitrogen rate. The total nitrogen applied is shown at the top of Figure 3. These totals indicate the amount of nitrogen applied to the strip, not the rate per acre. Each strip was approximately a quarter acre in area. The total strip application illustrates that the variable nitrogen rate approach did not apply less nitrogen than the uniform, recommended nitrogen rate of 180 pounds nitrogen/acre, on average. The distribution of nitrogen, however, was substantially different. Averaged across six replications of the variable rate treatment, the total amount applied to the strip was 252 pounds of nitrogen. The total amount applied to the recommended nitrogen rate strips was 248 pounds nitrogen, on average. At this site, the variable rate approach did not reduce the amount of nitrogen applied or affect yield, compared to the uniform recommended nitrogen rate. Variable rate application did, however, allow fertilizer nitrogen to be distributed much differently, which may increase fertilizer use efficiency and reduce the amount of nitrate-nitrogen left in the soil subject to leaching.

Table 1. Treatment Total Nitrogen Rate

Treatment	*Total N Rate (lb/acre)*	*Yield (bu/acre)*
-55	125	152
REC	180	158
variable	VAR	157
+35	215	155

Soil samples will be collected from these strips in the winter of 1993 to evaluate the effect of variable nitrogen application on residual nitrogen levels.

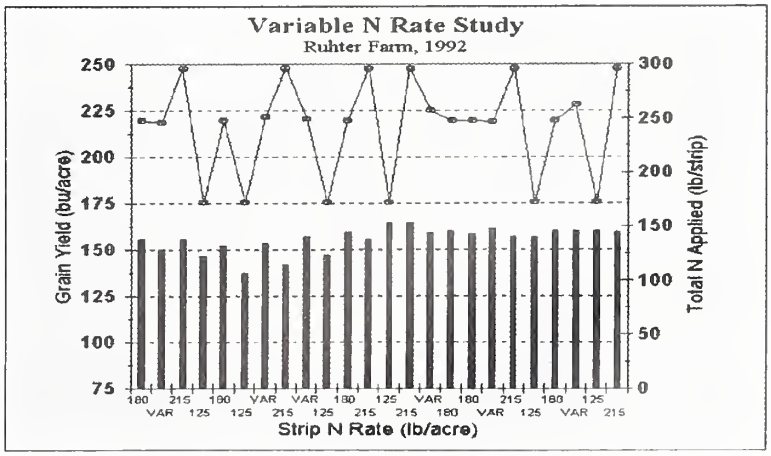


Figure 3. Grain yield and total N applied, Ruhter variable rate site, 1992.

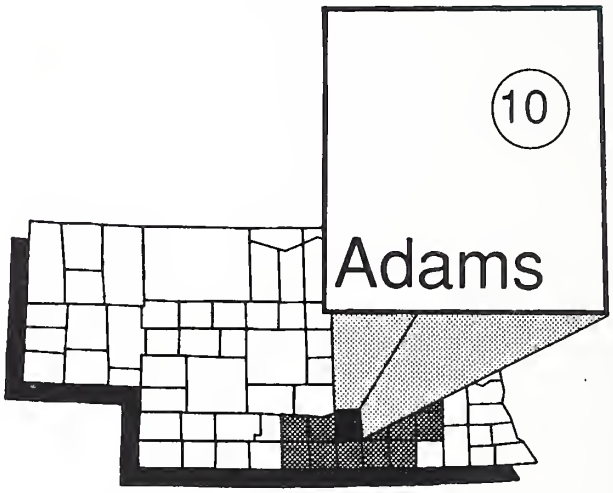
Site 10

Myles Ramsey/William McLeod - Adams County

General Information:

This field is located on the William McLeod farm one mile south and ½ mile east of Prosser in Adams County. The soil type is a Kenesaw silt loam with a 0-1 percent slope.

The only field preparation prior to planting was shredding stalks. Pioneer 3417 was planted on May 4 in 36-inch rows. Harvest population was 26,500 plants/ acre.



Nitrogen Management:

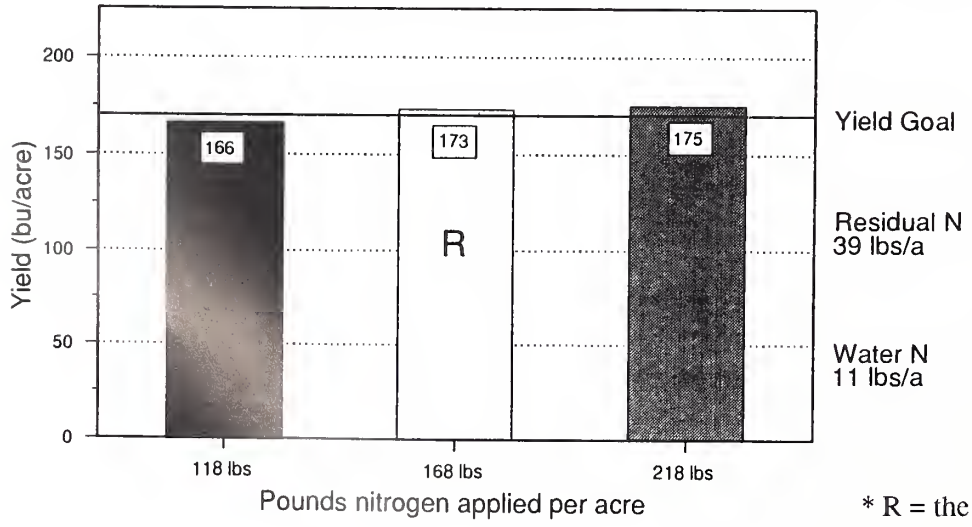
Myles included nitrogen rate comparison plots in this field. The plots were 12 rows wide, 2,620 feet long and replicated four times. The treatments are shown in the graph below. Myles' yields exceeded the yield goal in 1992. Nitrogen was split-applied with six gallons 10-34-0 and four gallons 12-0-0-26S. This was placed in a 2X2 band prior to planting. Anhydrous ammonia was sidedressed in the bottom of the furrow on June 19, 1992.

The recommended rate of nitrogen was determined using a 170-bushel yield goal. The rate applied was calculated by subtracting soil, manure, and irrigation water nitrogen from the nitrogen required for 170 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation water accounted for 5.2 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water.

Yield Results

Yield goal: 170 bu/acre

N required for yield goal: 168 lbs/acre



* R = the UN-L recommended rate

General Fertility	
pH	6.6
OM	1.9%
P	29 ppm
K	293 ppm
Zn	2.81 ppm

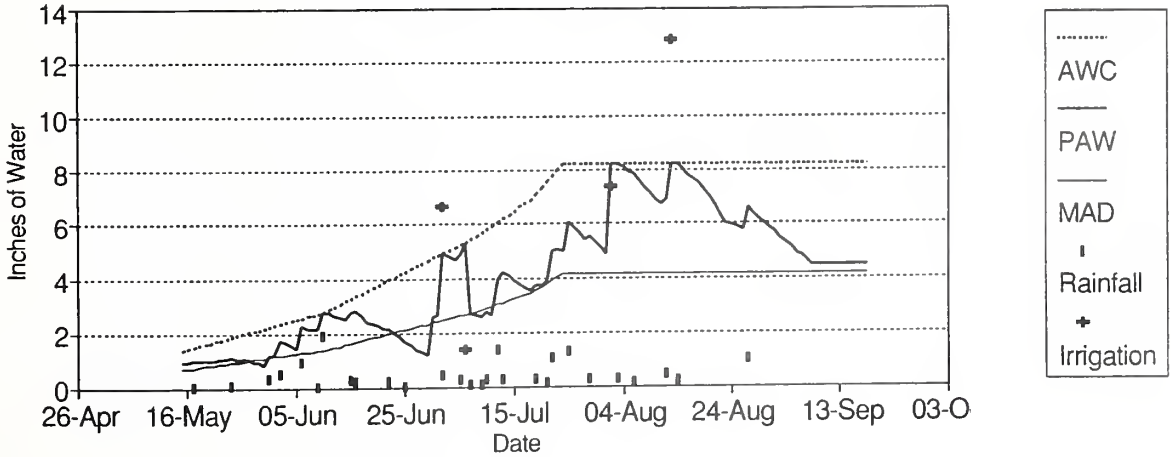
Treatment	-50	Rec	+50
N rate (lbs/acre)	118	168	218
Yield avg. (bu/acre)	166	173	175
Test wt. (lbs/bu)	56	56	56
Moisture (%)	17.2	17.0	17.4

Year		Water N (lbs/acre)	Soil Res-N (lbs/acre)	N Applied (lbs/acre)	Yield (bu/acre)	2-Year Average	
1991	-50			120	161		
	Rec		**58**	**170**	**163**	Avg N Applied	Avg Yield
	+50			120	162		
1992	-50	11	36	118	166	119	164
	Rec		**39**	**168**	**173**	**169**	**168**
	+50		46	218	175	219	169

Irrigation Management:

This site was gravity irrigated with a surge valve, watering every furrow. Irrigation was scheduled in 1992 using the appearance and feel and the checkbook methods. The field received 12.93 inches of rainfall between May 1 and September 9, 1992, and 28.40 inches of water were applied in four irrigations.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



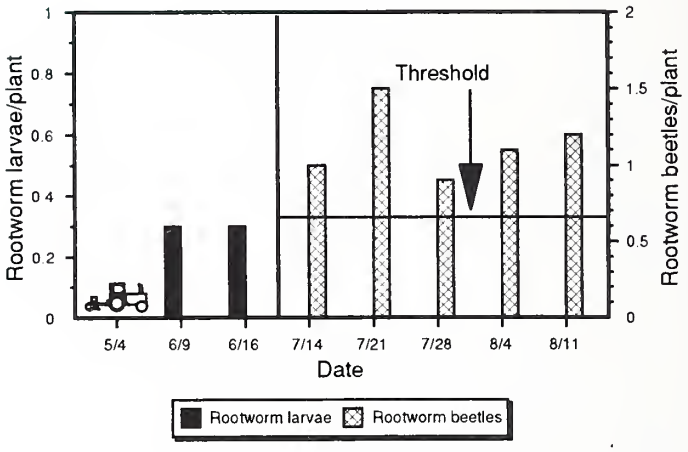
Integrated Pest Management:

Myles banded one quart of Bicep at planting. The field was cultivated on June 19.

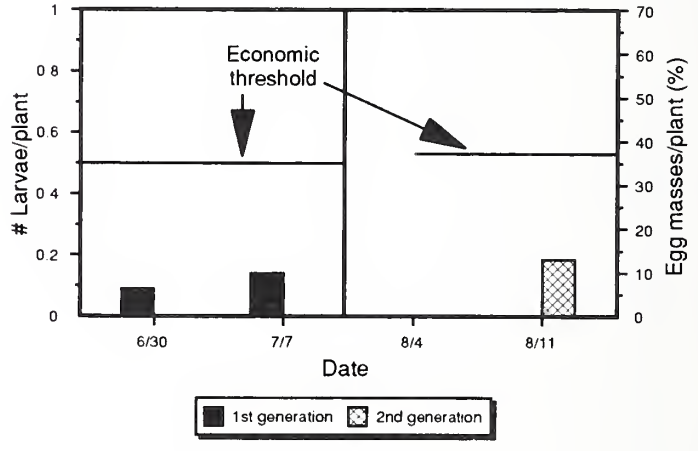
Rootworm larvae were managed with seven pounds of Force at planting time. The rootworm beetle count exceeded the threshold on July 14. This indicated there is a chance that rootworm larvae will cause more damage than the cost of treatment in 1993 if the field is planted to corn.

European corn borer never reached threshold levels for first or second generations.

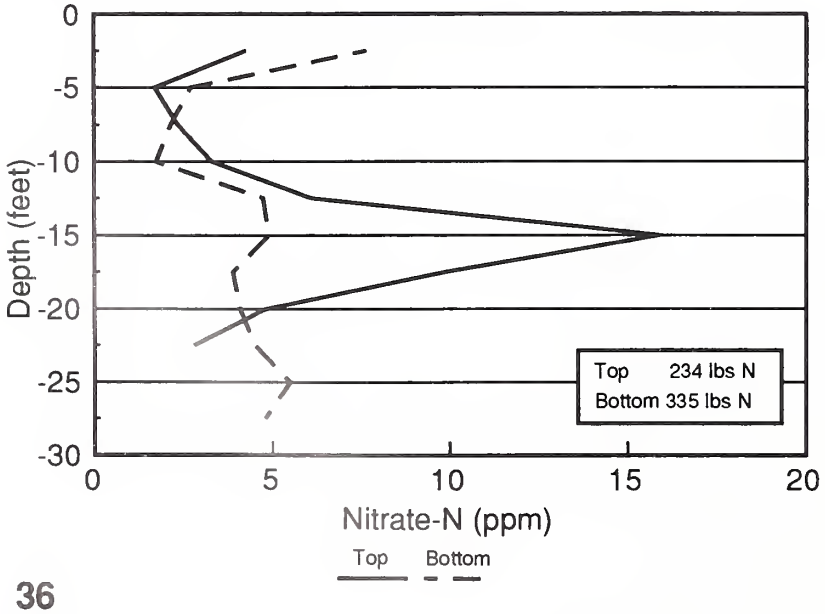
Rootworm Management



Corn Borer Management



Vadose Zone Nitrate



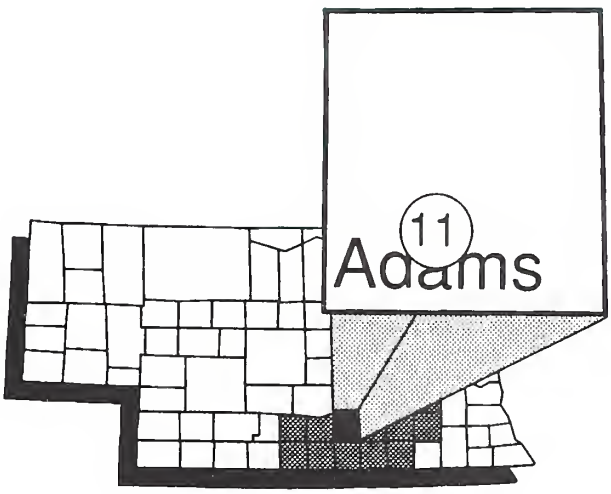
The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

Site 11

Larry Christenson - Adams County

General Information:

Site 11 is located on the Christenson farm five miles south of Holstein in Adams County. This gravity-irrigated farm has used a corn/soybean rotation as a part of its normal practices. The soil type is a Hord silt loam with a 0-1 percent slope.



Farm practices included shredding stalks and placing NH_3 down the old row prior to planting. Fontanelle 5230 was planted on April 25 in 30-inch rows. Harvest population was 26,250 plants/acre.

Nitrogen Management:

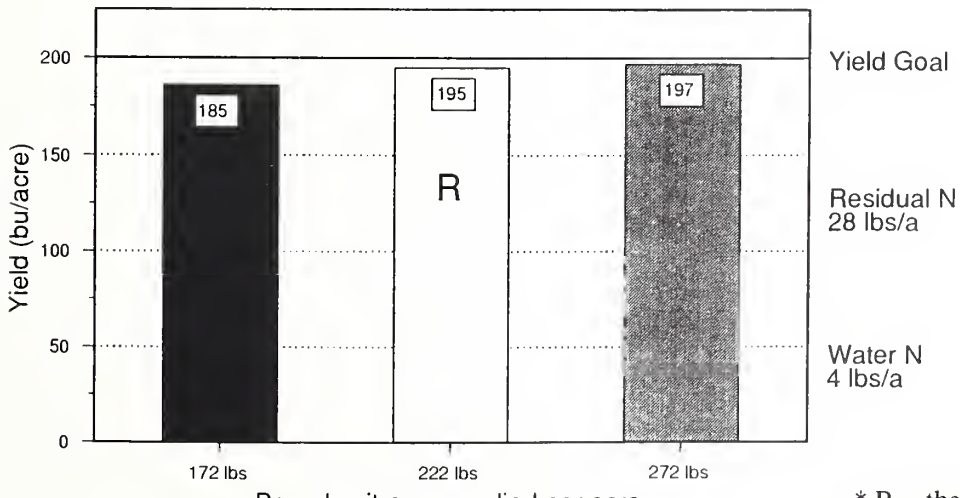
Larry included nitrogen rate comparison plots in this field. The plots were eight rows wide, 2,541 feet long and replicated four times. The treatments are shown in the graph below. Larry's yields were good in 1992. Anhydrous ammonia was applied preplant in the bottom of the furrow on March 3, 1992. Ten gallons 10-34-0 was broadcast as a starter fertilizer on April 15, 1992.

The recommended rate of nitrogen was determined using a 200-bushel yield goal. The rate applied was calculated by subtracting soil, manure, and irrigation water nitrogen from the nitrogen required for 200 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation water accounted for 2.2 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water.

Yield Results

Yield goal: 200 bu/acre

N required for yield goal: 222 lbs/acre



* R = the UN-L recommended rate

General Fertility	
pH	6.6
OM	2.0%
P	27 ppm
K	371 ppm
Zn	2.23 ppm

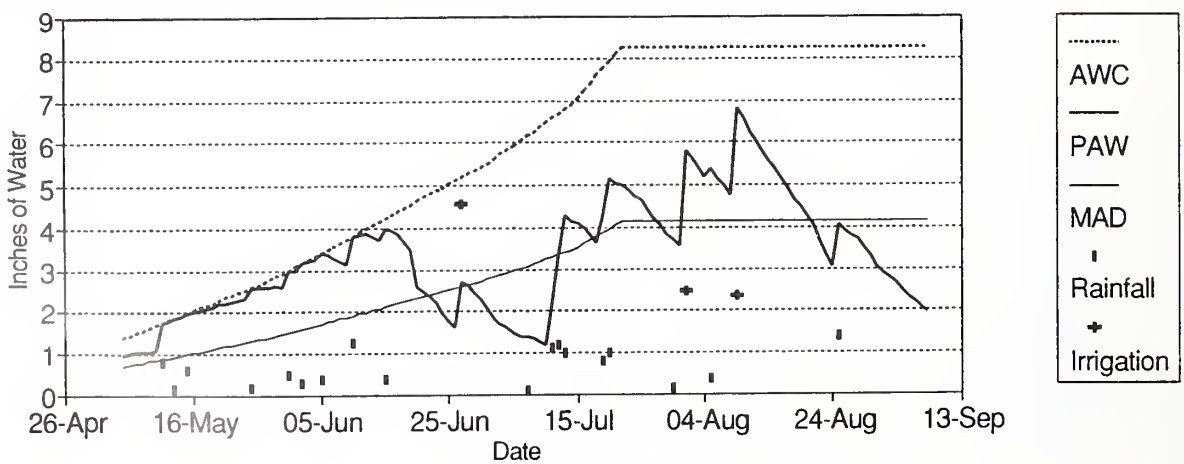
Treatment	-50	Rec	+50
N rate (lbs/acre)	172	222	272
Yield avg. (bu/acre)	185	195	197
Test wt. (lbs/bu)	58	58	58
Moisture (%)	19.8	19.6	19.6

Year		Water N (lbs/acre)	Soil Res-N (lbs/acre)	N Applied (lbs/acre)	Yield (bu/acre)	2-Year Average	
	-50			85	168		
1991	**Rec**		**129**	**135**	**178**	Avg N Applied	Avg Yield
	+50			185	182		
	-50	11	30	172	185	129	177
1992	**Rec**		**28**	**222**	**195**	**179**	**187**
	+50		24	272	197	229	190

Irrigation Management:

This site was gravity irrigated, watering every furrow. Irrigation was scheduled in 1992 using the appearance and feel and the checkbook methods. The field received 11.75 inches of rainfall between May 1 and September 9, 1992, and 9.43 inches of water were applied in four irrigations.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



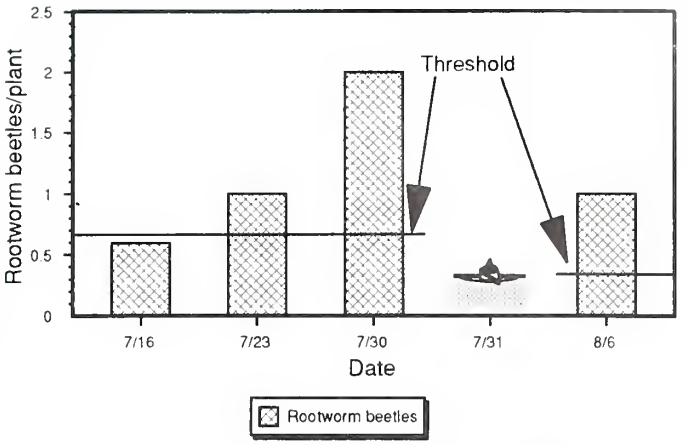
Integrated Pest Management:

Larry banded 1.2 quarts of Bicep at planting. The field was cultivated on June 8 and hilled on June 20.

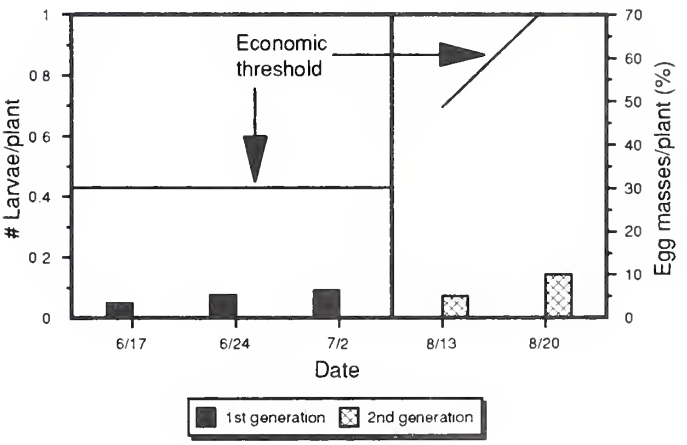
Rootworm control was tested on a nearby field. Larry applied 7.5 pounds of Lorsban at cultivation time, leaving untreated check strips for comparison. The yields are shown in Figure 5 on page 11. Rootworm beetle numbers exceeded the threshold on July 23. He also had a heavy infestation of western bean cutworms reaching 25 percent on July 30. He treated with 4 ounces of Pounce on July 31. Rootworm beetle numbers continued to exceed the threshold, indicating a chance that rootworm larvae will cause more damage than the value of treatment in 1993 if the field is planted to corn.

European corn borer never reached threshold levels for first or second generations.

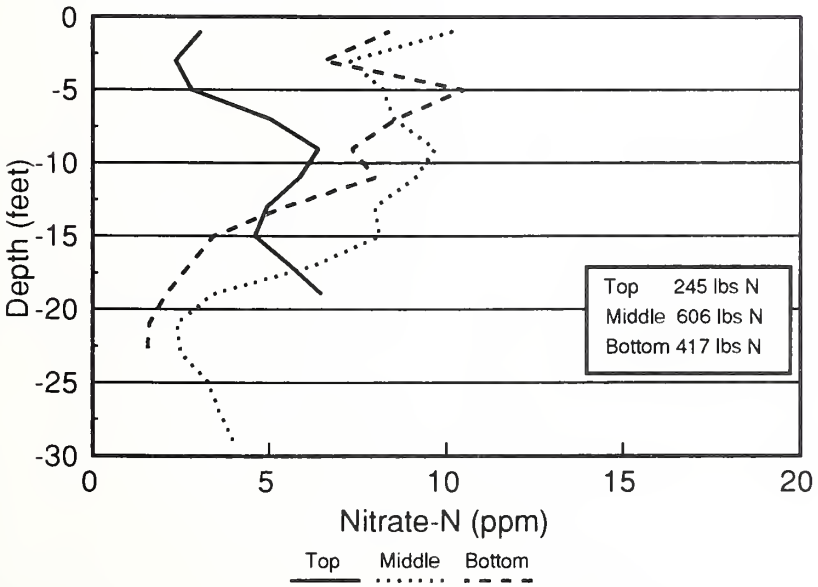
Rootworm Management



Corn Borer Management



Vadose Zone Nitrate



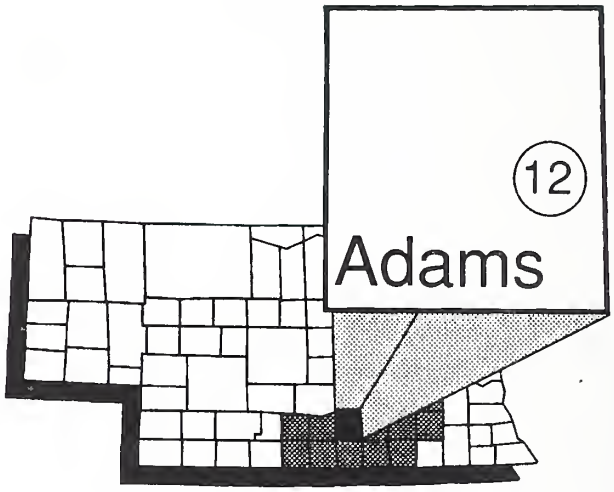
The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

Site 12

Bruce Bohlen - Adams County

General Information:

Site 12 is located on the Bruce Bohlen farm one mile south of the Muriel Elevator on Showboat Road south of Hastings in Adams County. This pivot-irrigated farm has been in continuous corn production and this year was planted to seed corn. The soil type is a Hastings silt loam with a 0-1 percent slope.



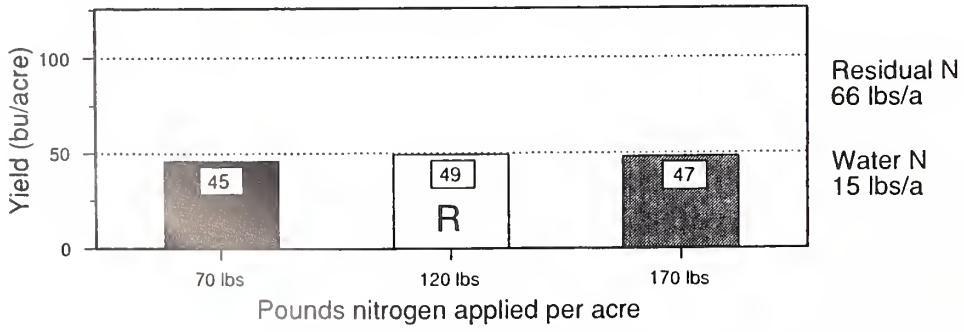
Bruce's preplant soil preparation included shredding stalks and two diskings. Liquid fertilizer was applied prior to planting, as well as later through the pivot system. The seed corn (code name WAVY) was planted on April 16 in 30-inch rows.

Nitrogen Management:

Bruce included nitrogen rate comparison plots in this field. The plots were eight rows wide, 2,486 feet long and replicated four times. The treatments are shown in the graph below. Bruce's field was in seed corn in 1992. Yields were low in 1992 due to hail and wind damage that occurred in July and August. Nitrogen was split-applied and 28-0-0 was the main source. Four percent sulfur was added also. At planting, 4.75 gallons 10-34-0 plus one quart zinc was applied in furrow as the starter. Bruce fertigated twice, applying 52 and 23 pounds of 28-0-0 thru the pivot.

The recommended rate of nitrogen was determined using a yield goal of approximately 60 to 80 bushels/acre. The rate applied was determined in consultation with Pioneer Hybred, University of Nebraska/SCREC, and Bruce. Seed corn yields are highly variable and this recommendation was consistent with anticipated yield of this inbred. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation water accounted for 7.4 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water.

Yield Results



* R = the UN-L recommended rate

General Fertility	
pH	6.5
OM	2.5%
P	9 ppm
K	286 ppm
Zn	0.95 ppm

Treatment	-50	Rec	+50
N rate (lbs/acre)	70	120	170
Yield avg. (bu/acre)	45	49	47
Test wt. (lbs/bu)	n/a	n/a	n/a
Moisture (%)	37.4	37.4	37.4

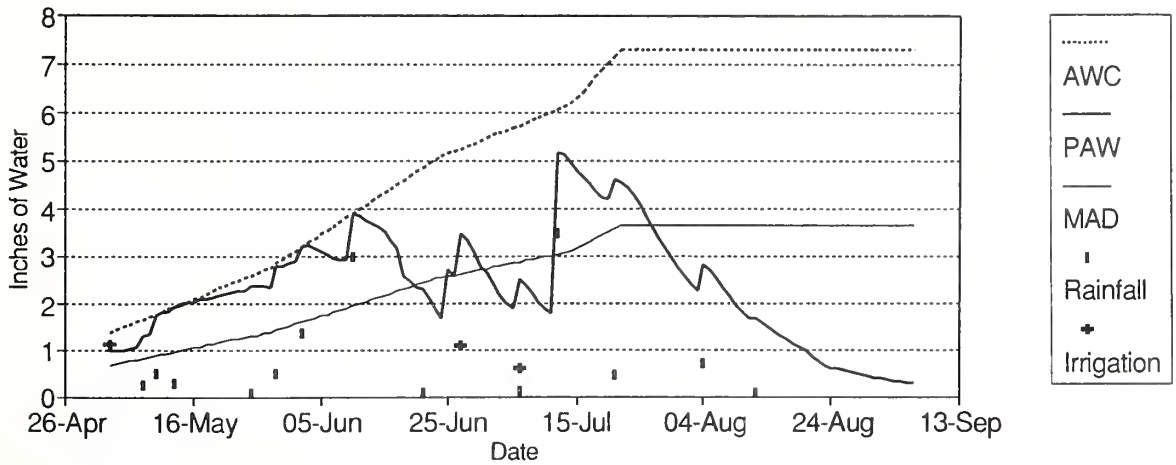
Year		Water N (lbs/acre)	Soil Res-N (lbs/acre)	N Applied (lbs/acre)	Yield (bu/acre)	
1991	-50			165	198	
	Rec		**49**	**215**	**203**	
	+50			265	211	
1992*	-50	15	56	70	45	
	Rec		**66**	**120**	**49**	
	+50		80	170	47	

** Yields were lowered in 1992 due to hail and wind damage.*

Irrigation Management:

This site was sprinkler irrigated. Irrigation was scheduled in 1992 using the appearance and feel and the checkbook methods. The field received 10.47 inches of rainfall between May 1 and September 9, 1992, and 3.49 inches of water were applied in three irrigations.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.

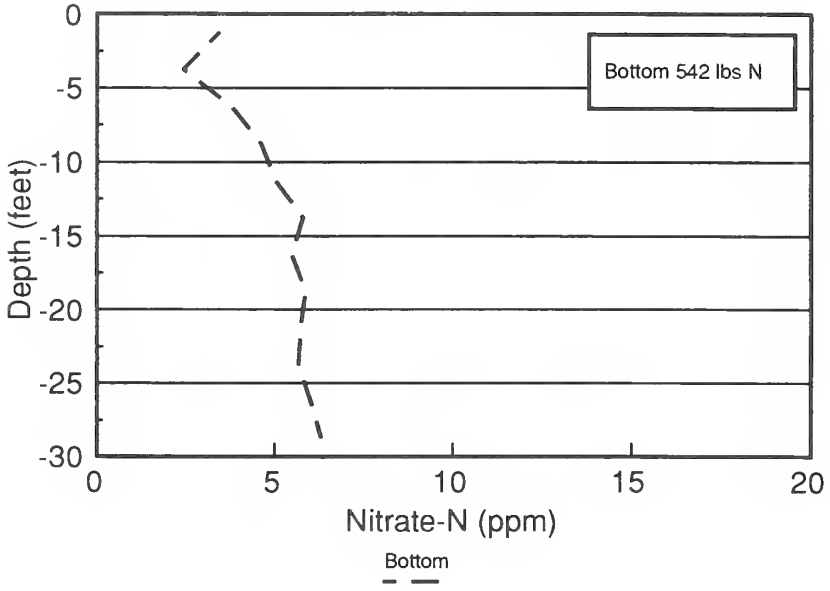


Integrated Pest Management:

Bruce worked with Pioneer Seed for pest control on this seed-corn field. He applied 1.6 quarts of Bicep in a band at planting. The field was cultivated on May 21. Spot treatments for velvetleaf and sunflower control were made with Buctril plus atrazine on June 17 and 2,4-D on August 1. The field was ridged on June 25.

Rootworms were controlled with a T-band treatment of eight pounds of Force at planting. European corn borer was treated aerially with 10 pounds of Dipel on June 25.

Vadose Zone Nitrate



The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

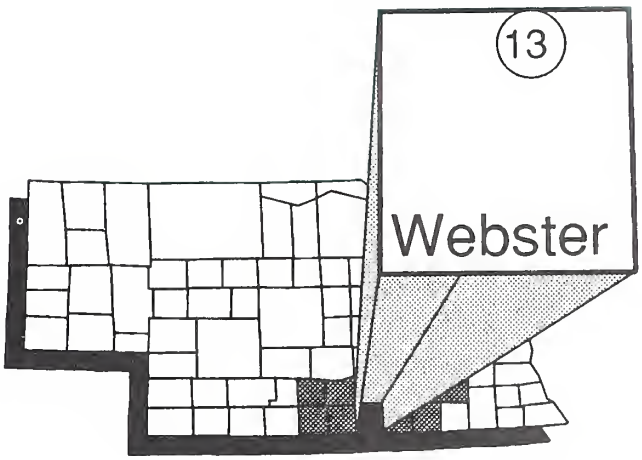
Site 13

Kevin Karr - Webster County

General Information:

Site 13 is located on the Kevin Karr farm ½ mile north of Bladen in Webster County. This pivot-irrigated farm was corn in 1990 and 1991. The soil type is a Hastings silt loam with a 0-1 percent slope.

Preplant soil preparation included shredding stalks and anhydrous NH_3 was applied down the old row. Starter fertilizer and zinc were applied at planting. Garst 8492 was ridge-planted on April 25. Harvest population was 27,500 plants/acre.



Nitrogen Management:

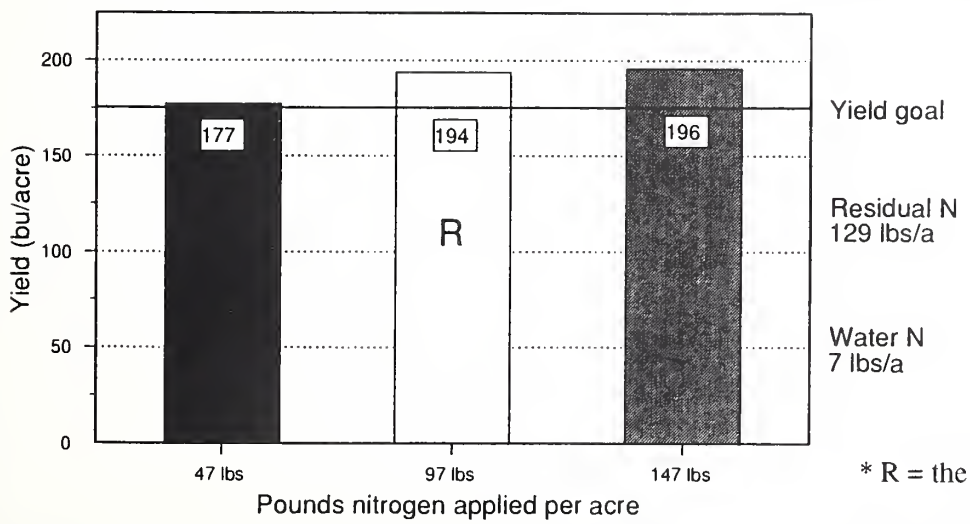
Kevin included nitrogen rate comparison plots in this field. The plots were 12 rows wide, 1,275 feet long and replicated four times. The treatments are shown in the graph below. Kevin's yields were excellent in 1992 despite frost and hail damage that occurred in May and July. Anhydrous ammonia was applied preplant on March 31, 1992. At planting, five gallons 10-34-0 plus one quart zinc were applied with the seed as the starter.

The recommended rate of nitrogen was determined using a 175-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation water nitrogen from the nitrogen required for 175 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation water accounted for 3.6 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water.

Yield Results

Yield goal: 175 bu/acre

N required for yield goal: 97 lbs/acre



* R = the UN-L recommended rate

General Fertility	
pH	6.4
OM	2.7%
P	26 ppm
K	1090 ppm
Zn	2.81 ppm

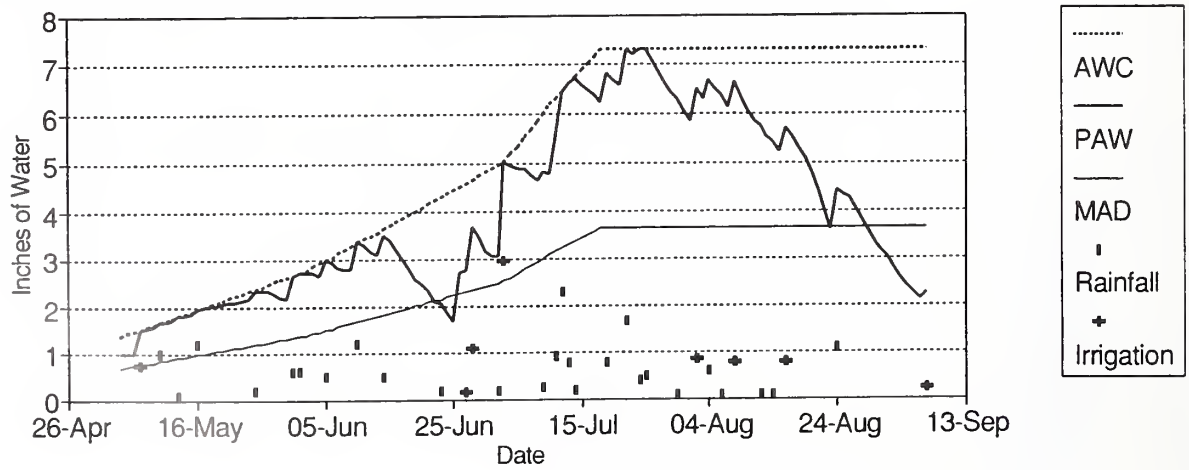
Treatment	-50	Rec	+50
N rate (lbs/acre)	47	97	147
Yield avg. (bu/acre)	177	194	196
Test wt. (lbs/bu)	56	56	56
Moisture (%)	16.4	15.6	17.0

Year		Water N (lbs/acre)	Soil Res-N (lbs/acre)	N Applied (lbs/acre)	Yield (bu/acre)	2-Year Average	
	-50			92	194		
1991	**Rec**		**91**	**142**	**191**	Avg N Applied	Avg Yield
	+50			192	199		
	-50	7	123	47	177	70	186
1992	**Rec**		**129**	**97**	**194**	**120**	**193**
	+50		187	147	196	170	198

Irrigation Management:

This site was sprinkler irrigated. Irrigation was scheduled in 1992 using soil moisture blocks, appearance and feel, and the checkbook methods. The field received 16.25 inches of rainfall between May 1 and September 9, 1992, and 7.60 inches of water were applied in eight irrigations.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



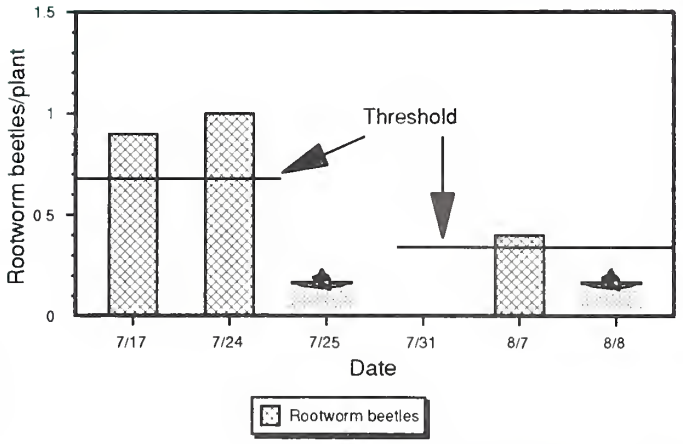
Integrated Pest Management:

Kevin banded 1.5 pounds of Extrazine II at planting to control velvetleaf, sunflower, cocklebur, grasses and shattercane. He spot-sprayed .3 ounces of LV 2,4-D in May for sunflower. He ridged the field without cultivation on June 18.

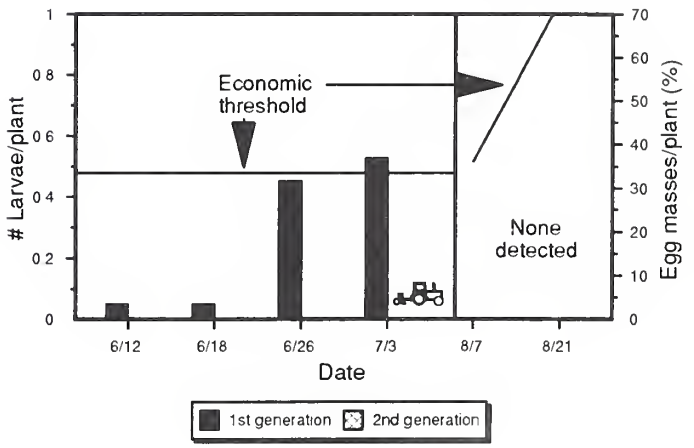
Rootworm larvae were managed with the beetle control program. Soil insecticide was not used. The rootworm beetle threshold was exceeded on July 17 at .9 beetles/plant. The field was sprayed with one pint of Penncap-M on July 25. Beetle numbers increased to a treatable level on August 7. Western bean cutworm also exceeded the threshold of 8 percent, so the field was treated on August 8 with two pints of Penncap-M.

First-generation European corn borer exceeded the threshold, rising to 30 percent on June 26 and more than .5 live larvae/plant on July 3. The field was treated with an aerial application of Dyfonate 20G at four pounds on July 3. Second-generation European corn borer did not exceed threshold levels.

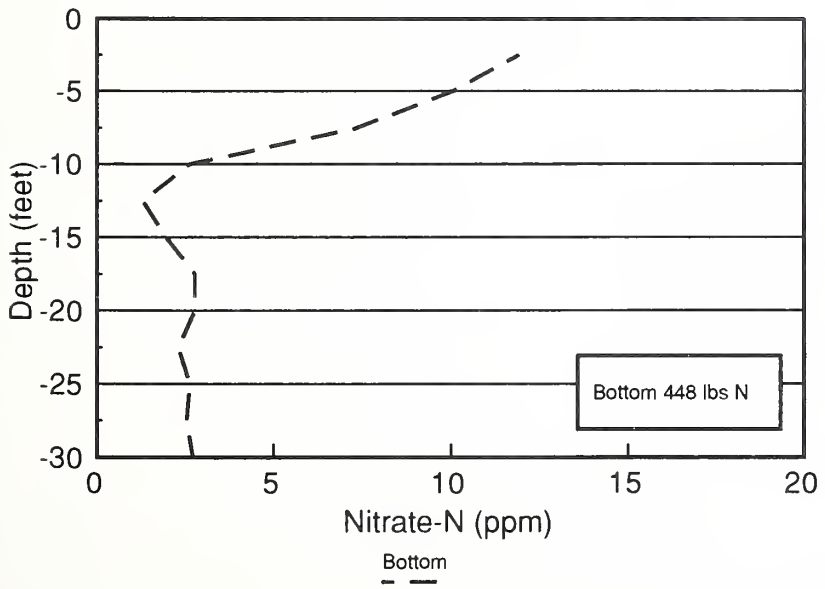
Rootworm Management



Corn Borer Management



Vadose Zone Nitrate



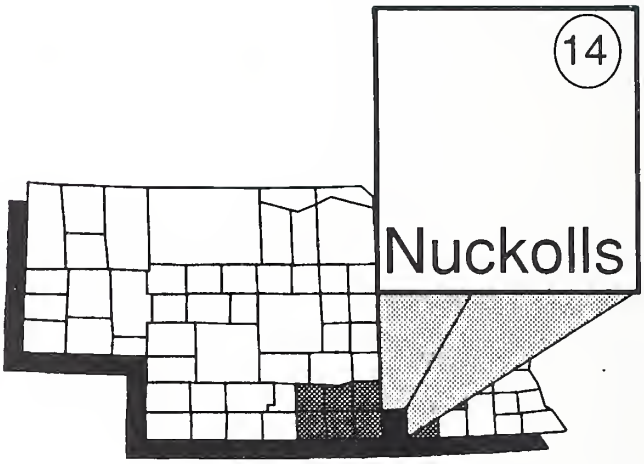
The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

Site 14

Lale Oellerich - Nuckolls County

General Information:

Site 14 is located on the Lale Oellerich farm two miles west and ¼ mile south of Davenport in Nuckolls County. This field has been in continuous corn production.The soil type is a Crete silt loam with a 0-1 percent slope.



Lale applied manure to this field throughout the spring. Shredding stalks and placing NH_3 down the old row were the only operations prior to planting. Lale ridge-planted Pioneer 3162 on April 14 in 36-inch rows. Harvest population was 26,250 plants/acre.

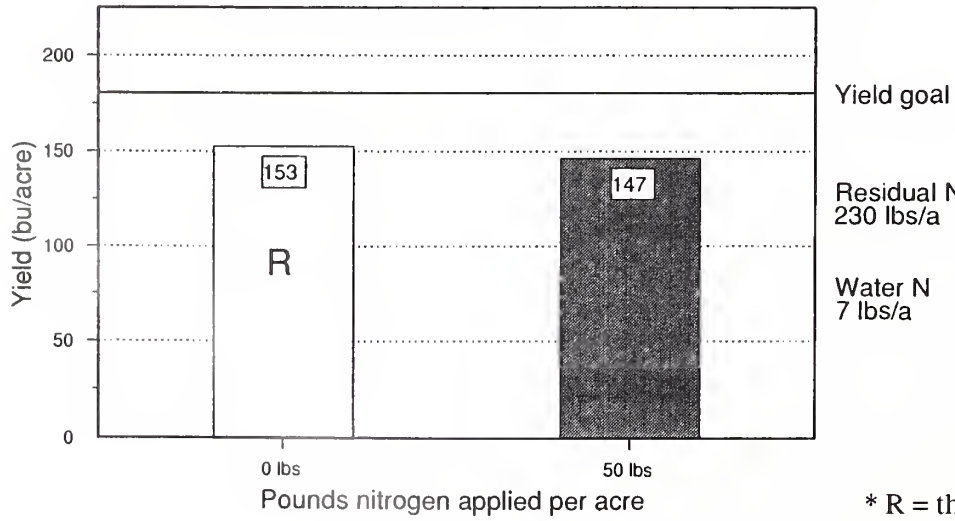
Nitrogen Management:

Lale included nitrogen rate comparison plots in this field. The plots were eight rows wide, 1,817 feet long and replicated four times. The treatments are shown in the graph below. Lale's yields were low in 1992 due to hail and wind damage that occurred in July. Anhydrous ammonia was applied sidedress on June 15, 1992.

The recommended rate of nitrogen was determined using a 180-bushel yield goal. The rate applied was calculated by subtracting soil, swine slurry, and irrigation water nitrogen from the nitrogen required for 180 bushels of corn. Lale's normal practice is to apply swine slurry manure to one-half of the field each year. As a result of the high soil residuals, Lale is currently hauling the manure to other fields. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation water accounted for 3.6 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water.

Yield Results

Yield goal: 180 bu/acre N required for yield goal: 0 lbs/acre



* R = the UN-L recommended rate

General Fertility	
pH	6.0
OM	3.0%
P	87 ppm
K	559 ppm
Zn	2.29 ppm

Treatment	-50	Rec	+50
N rate (lbs/acre)		0	50
Yield avg. (bu/acre)		153	147
Test wt. (lbs/bu)		56	57
Moisture (%)		17.5	17.4

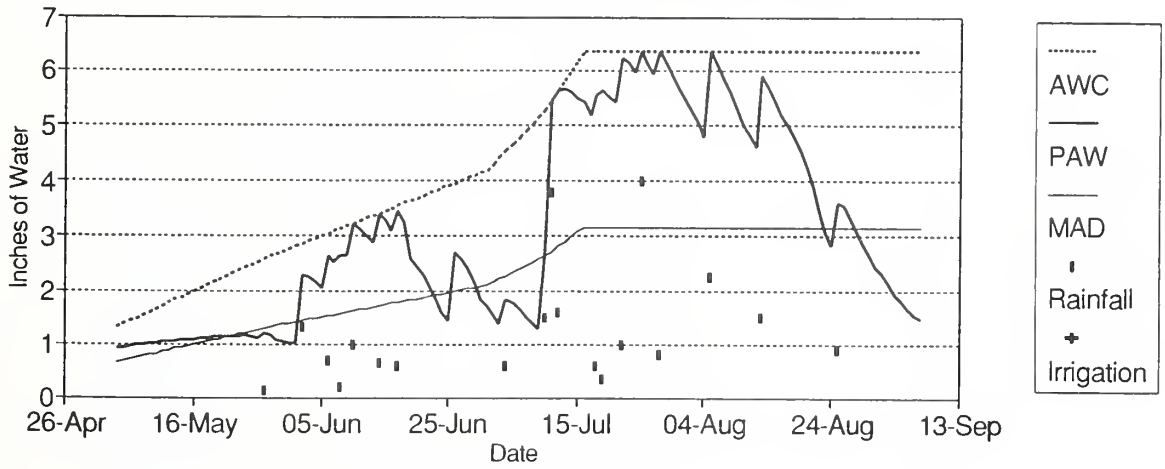
Year		Water N (lbs/acre)	Soil Res-N (lbs/acre)	N Applied (lbs/acre)	Yield (bu/acre)	2-Year Average	
	-50						
1991	**Rec**	**17**	**314**	**0**	**163**	Avg N	Avg
	+50			50	154	Applied	Yield
	-50						
1992*	**Rec**	**17**	**586**	**0**	**153**	**0**	**158**
	+50		542	50	147	50	151

** Yields were lowered in 1992 due to hail and wind damage.*

Irrigation Management:

This site was sprinkler irrigated. Irrigation was scheduled in 1992 using the appearance and feel and the checkbook methods. The field received 23.50 inches of rainfall between May 1 and September 9, 1992, and two inches of water were applied in two irrigations.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



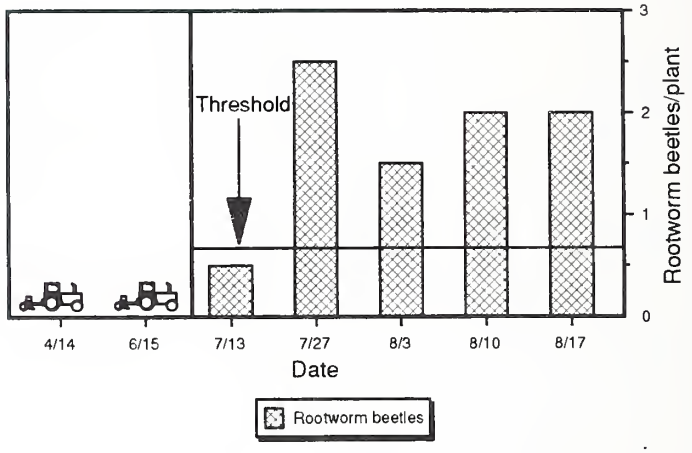
Integrated Pest Management:

Lale banded 1.33 quarts of Lariat at planting. The field was cultivated on May 15 and hilled on June 15.

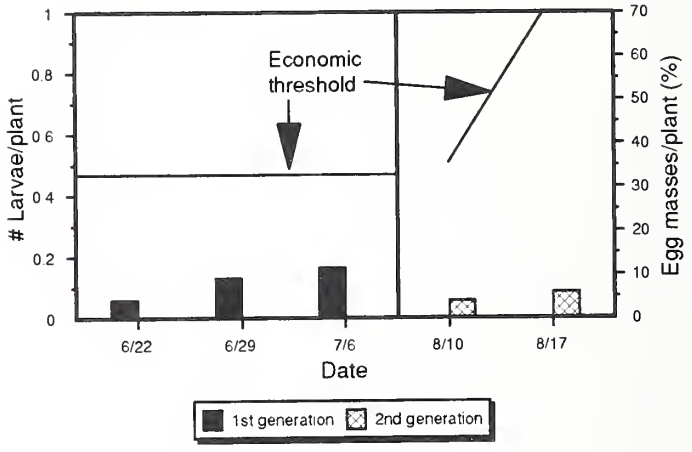
Rootworm larvae were managed with soil insecticide. Dyfonate II was banded at the 5.3-pound rate at planting. Leroy applied another 5.3 pounds of Dyfonate II on June 15 after root ratings of three indicated control may have been poor due to early application and weather conditions.

European corn borer did not exceed the threshold for either first or second generations. The Dyfonate treatment may have held the first-generation infestation down.

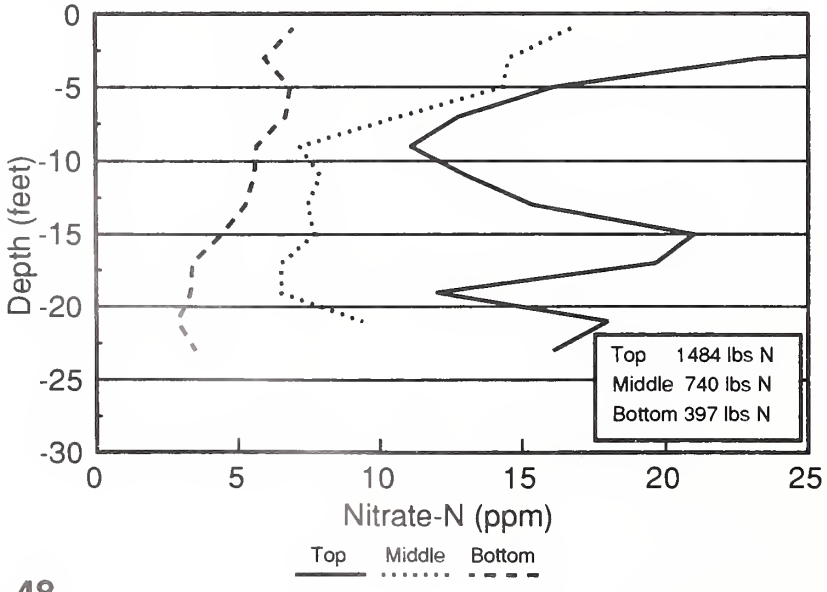
Rootworm Management



Corn Borer Management



Vadose Zone Nitrate



The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

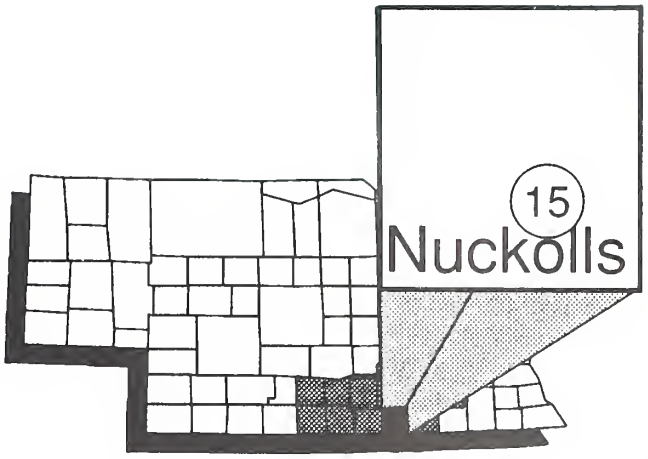
Site 15

Don Kottmeyer - Nuckolls County

General Information:

Site 15 is located five miles east of Superior in Nuckolls County. This field has been in continuous corn production. The soil type is a Hord silt loam with a 0-1 percent slope.

Stalks were shredded prior to planting. Don ridge-planted Golden Harvest 2572 on May 2 in 36-inch rows. A 28-0-0 liquid formulation was broadcast-applied on May 5. Harvest population was 20,750 plants/acre.



Nitrogen Management:

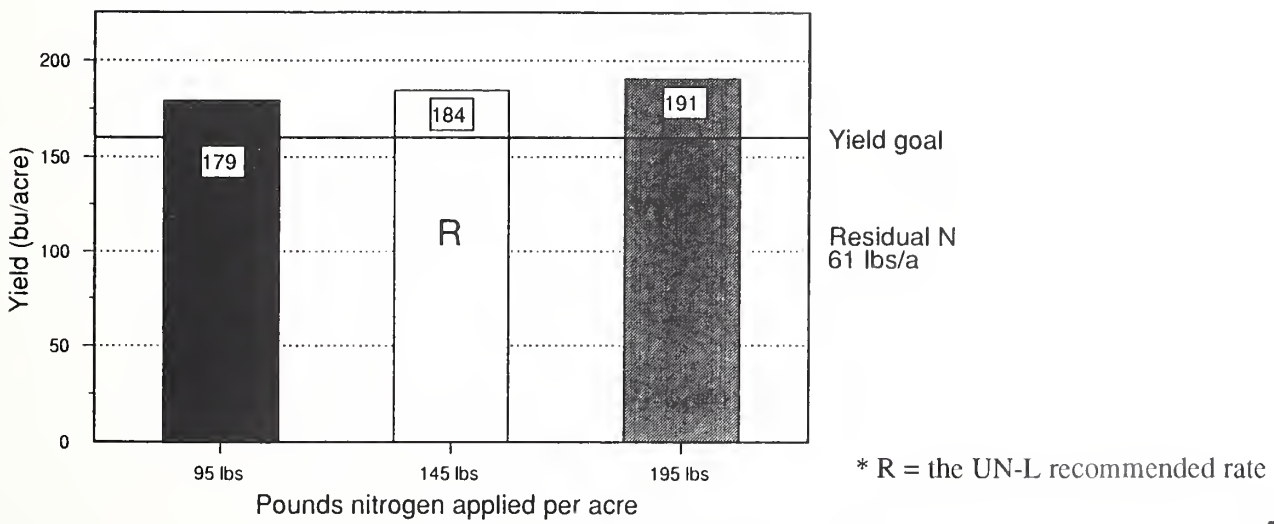
Don included nitrogen rate comparison plots in this field. The plots were 10 rows wide, and varied from 618 to 724 feet long and replicated four times. The treatments are shown in the graph below. Don's yields were excellent in 1992 despite not applying any irrigation water to the site. Nitrogen was broadcast with a floater using 28-0-0 on May 5, 1992.

The recommended rate of nitrogen was determined using a 160-bushel yield goal. The rate applied was calculated by subtracting soil nitrogen from the nitrogen required for 160 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation water was not accounted for because Don irrigates from the canal. Canal water was found to contain less than one ppm nitrate-nitrogen. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water.

Yield Results

Yield goal: 160 bu/acre

N required for yield goal: 145 lbs/acre



* R = the UN-L recommended rate

General Fertility	
pH	5.7
OM	3.5%
P	41 ppm
K	631 ppm
Zn	2.63 ppm

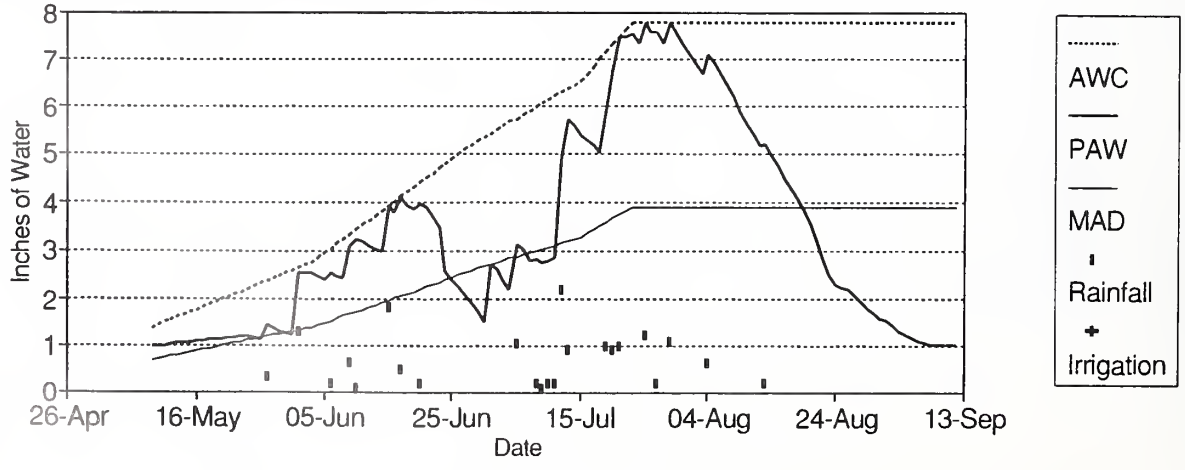
Treatment	-50	Rec	+50
N rate (lbs/acre)	94	144	194
Yield avg. (bu/acre)	174	184	191
Test wt. (lbs/bu)	57	57	57
Moisture (%)	17.9	17.9	18.1

Year		Water N (lbs/acre)	Soil Res-N (lbs/acre)	N Applied (lbs/acre)	Yield (bu/acre)	3-Year Average	
	-50		74	80	151		
1990	**Rec**		**88**	**130**	**152**		
	+50		41	180	155		
	-50		72	100	152		
1991	**Rec**		**62**	**150**	**156**	Avg N Applied	Avg Yield
	+50		86	200	160		
	-50		91	94	179	91	161
1992	**Rec**		**91**	**144**	**184**	**141**	**164**
	+50		93	194	191	191	169

Irrigation Management:

This site was gravity irrigated, watering every furrow. Irrigation was scheduled in 1992 using the appearance and feel and the checkbook methods. Soil moisture blocks were also used to determine moisture status. The field received 17.10 inches of rainfall between May 1 and September 9, 1992, and no irrigation water was applied. Being on a canal, Don could only use six inches of irrigation water, so scheduling was very important on this field. Normally, this amount would be used up in two or three irrigations.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.

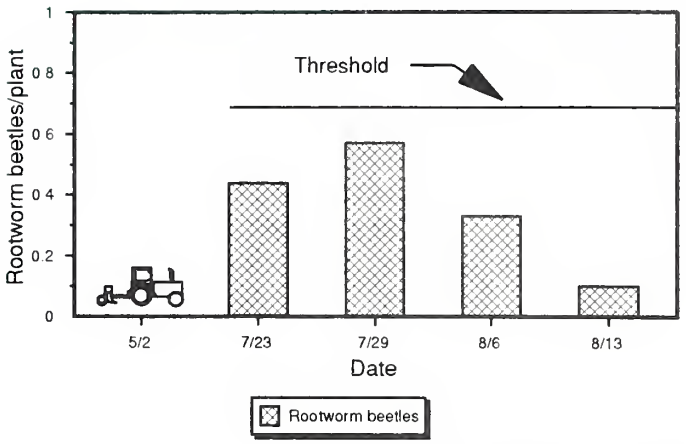


Integrated Pest Management:

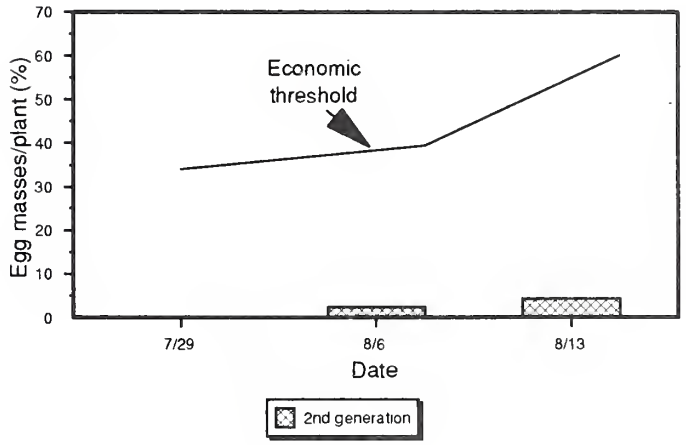
Don banded one pint of Bicep and one pound of atrazine at planting. Rootworm larvae were managed with soil insecticide. Dyfonate II was banded at the 5.3-pound rate at planting. Rootworm beetles exceeded the threshold on the west half of the field on July 23, but were only marginal on a whole field basis. Don will have a decision to make on whether or not to treat in 1993.

European corn borer did not exceed the threshold for either first or second generations.

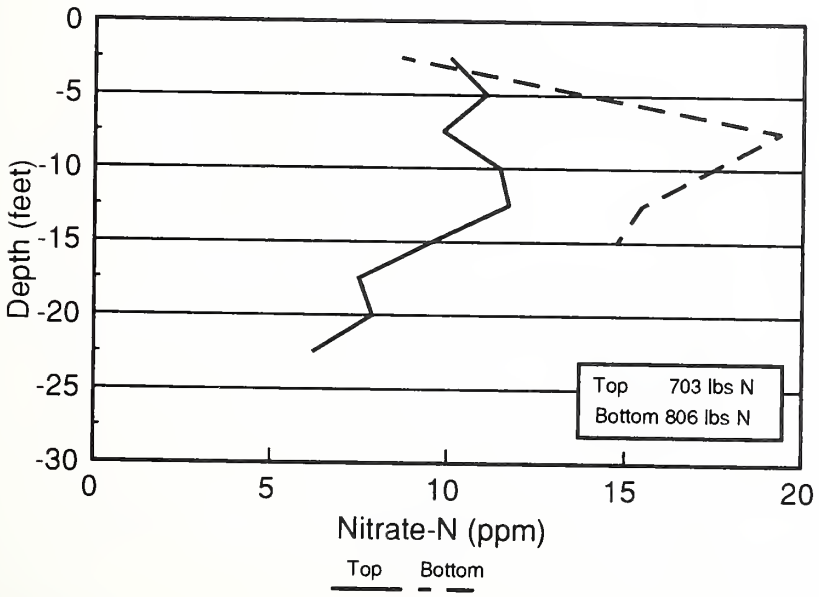
Rootworm Management



Corn Borer Management



Vadose Zone Nitrate



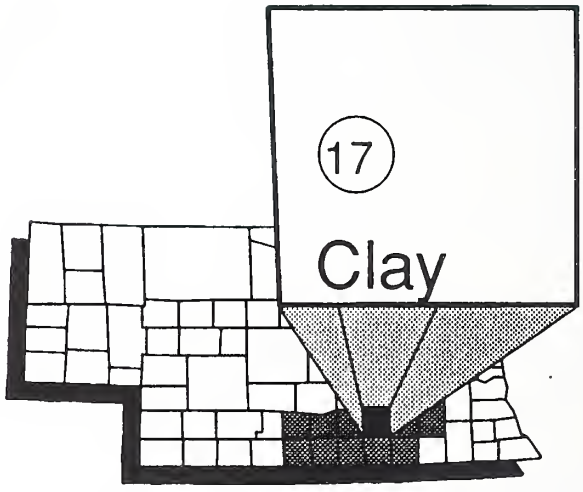
The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

Site 17

Dave Hamburger - Clay County

General Information:

Site 17 is located on the Dave Hamburger farm one mile east of Inland on Highway 6 in Clay County. A corn/soybean rotation has been a standard management practice on this farm. The soil type is a Crete silt loam with a 0-1 percent slope.



Dave's farm practices included two diskings and a preplant application of NH_3. Dave planted NC+ 6414 on April 30 in 30-inch rows. A liquid formulation of 10-34-0 was also applied at planting. Harvest population was 21,500 plants/acre.

Nitrogen Management:

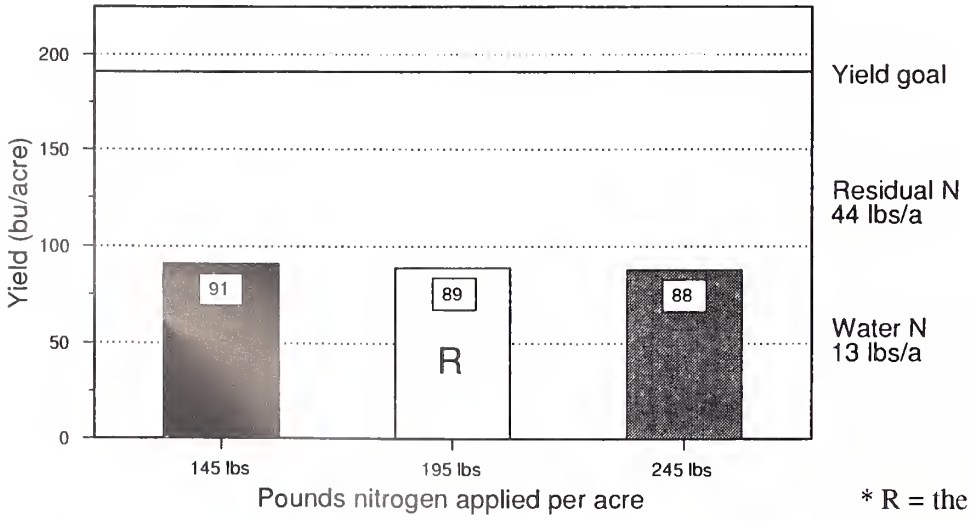
Dave included nitrogen rate comparison plots in this field. The plots were six rows wide, 1,609 feet long and replicated four times. The treatments are shown in the graph below. Dave's yields were substantially lower this year due to hail damage losses estimated at 60 percent. The nitrogen was split-applied, with 145 pounds of anhydrous being applied on April 10. Four pounds were applied with the seed in the form of 10-34-0 liquid starter, and the balance of the other two treatments was applied in a sidedress application.

The recommended rate of nitrogen was determined using a 190-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 190 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation nitrogen accounted for 6.4 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water.

Yield Results

Yield goal: 190 bu/acre

N required for yield goal: 195 lbs/acre



* R = the UN-L recommended rate

General Fertility	
pH	6.2
OM	2.7%
P	22 ppm
K	340 ppm
Zn	2.16 ppm

Treatment	-50	Rec	+50
N rate (lbs/acre)	145	195	245
Yield avg. (bu/acre)	92	90	88
Test wt. (lbs/bu)	50	51	51
Moisture (%)	14.4	13.9	13.9

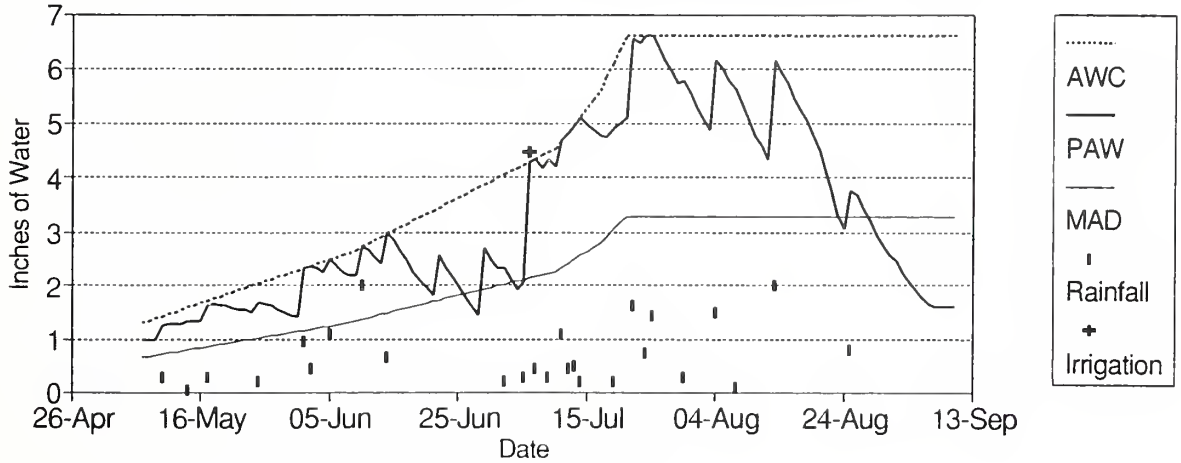
Year		Water N (lbs/acre)	Soil Res-N (lbs/acre)	N Applied (lbs/acre)	Yield (bu/acre)	2-Year Average	
	-50			65	184		
1991	**Rec**		**125**	**115**	**191**	Avg N Applied	Avg Yield
	+50			165	195		
	-50	13	38	145	92	105	138
1992*	**Rec**		**44**	**195**	**90**	**155**	**141**
	+50		38	245	88	205	142

** Yields were lowered in 1992 due to hail damage.*

Irrigation Management:

This site was gravity irrigated, watering alternate (every other) furrows. Irrigation was scheduled in 1992 using the appearance and feel, and the checkbook methods. The field received 17.45 inches of rainfall between May 1 and September 9, 1992, and 4.47 inches of water were applied in one irrigation.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



Integrated Pest Management:

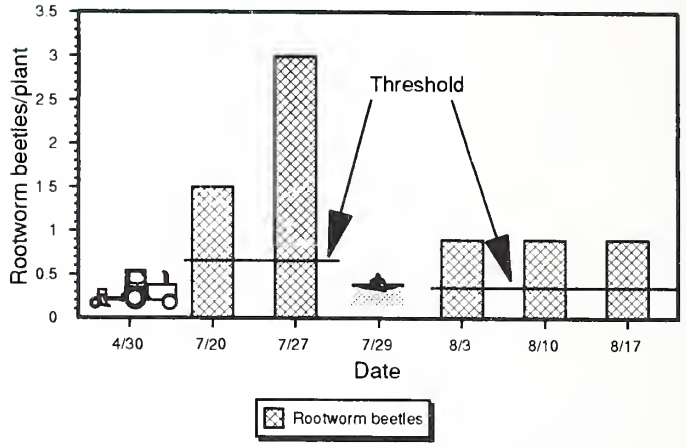
Dave banded 1.5 quarts of Lariat at planting time. Marksman was broadcast at three pints/acre on May 27 to control pigweed and velvetleaf.

Rootworm larvae were controlled with 6.5 pounds of Counter 20CR at planting time. Beetle numbers were high enough to indicate a need for rootworm control in 1993 if corn is planted again.

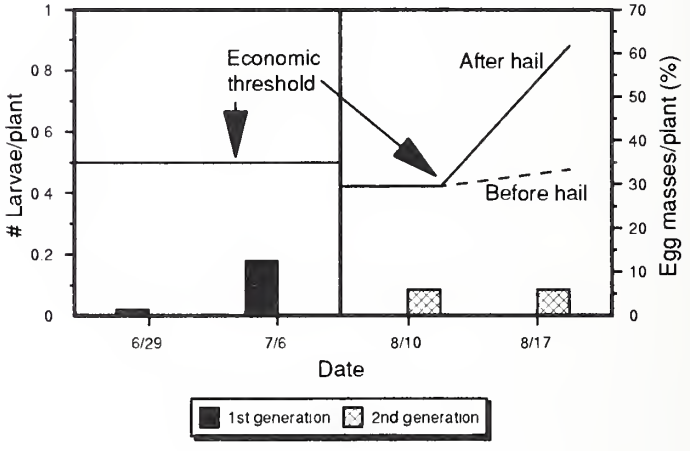
Western bean cutworm increased above the threshold of 8 percent on July 20, rising to 14 percent on July 27. The field was sprayed on July 29 with one pint of Penncap-M plus two ounces of Pounce. Western bean cutworm control was good.

European corn borer did not reach threshold levels for either first or second generations. Severe hail damage reduced the expected yield, increasing the corn borer threshold as there were fewer bushels to save by a treatment.

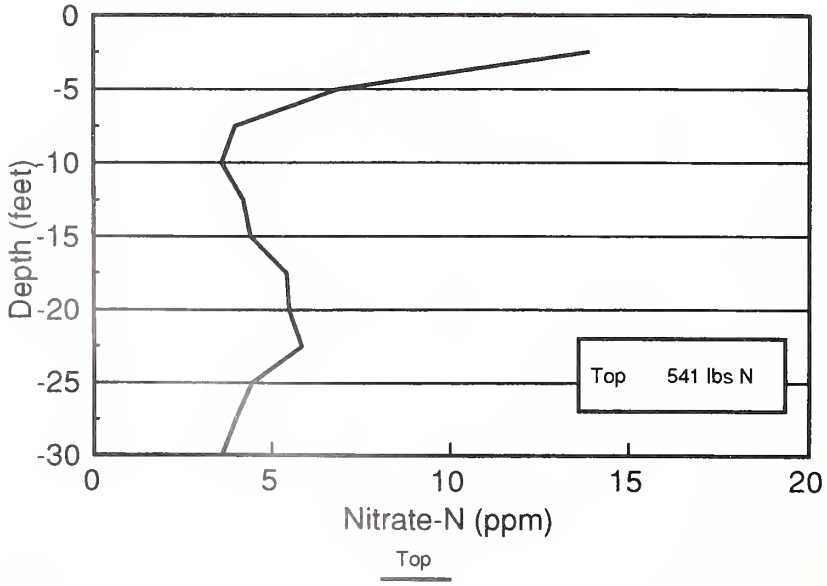
Rootworm Management



Corn Borer Management



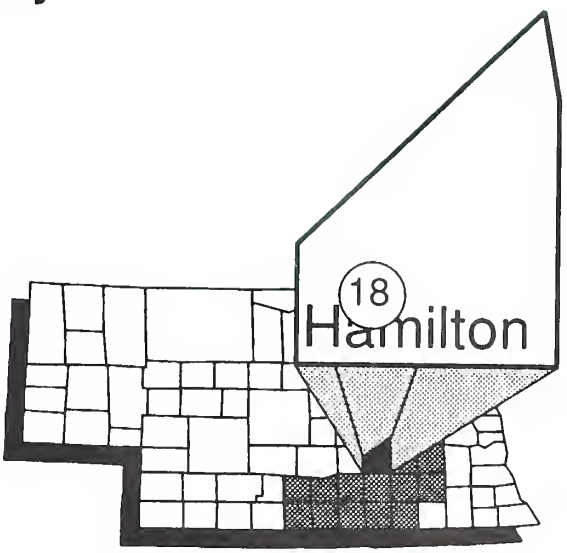
Vadose Zone Nitrate



The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

Site 18

Clayton Higgins - Hamilton County



General Information:

Site 18 is located on the Clayton Higgins farm ½ mile west of Giltner in Hamilton County. This field has been in continuous corn production. The soil type is a Hastings silt loam with a 0-1 percent slope.

The only field operation prior to planting was shredding stalks. A preplant application of 11-52-0-2Zn preceded the operation of ridge-planting Fontanelle 6235 on April 27 in 36-inch rows. Harvest population was 29,000 plants/acre.

Nitrogen Management:

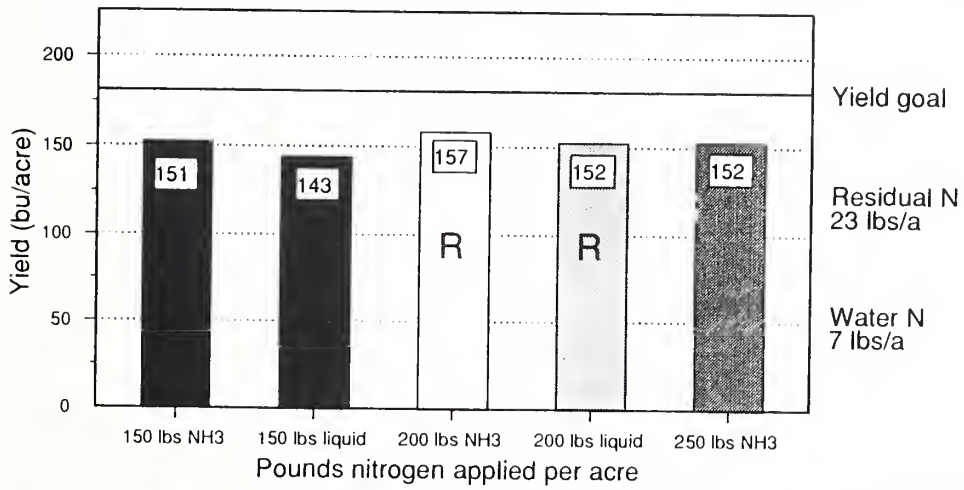
Clayton included nitrogen rate comparison plots in this field. The plots were 12 rows wide, of varied length, and replicated four times. The treatments are shown in the graph below. Clayton's field sustained a hail damage loss adjustment of 57 percent. The nitrogen was split-applied. Four pounds of nitrogen were applied in a preplant application of 11-52-0-2Zn. Five pounds were applied with the seed in the form of 10-34-0 liquid starter, and the balance of the nitrogen was applied in a sidedress application.

The recommended rate of nitrogen was determined using a 180-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 180 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation nitrogen accounted for 3.3 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water.

Yield Results

Yield goal: 180 bu/acre

N required for yield goal: 200 lbs/acre



* R = the UN-L recomended rate

General Fertility	
pH	6.4
OM	3.2%
P	21 ppm
K	441 ppm
Zn	1.74 ppm

Treatment	-50A	-50L	RecA	RecL	+50
N rate (lbs/acre)	150	150	200	200	250
Yield avg. (bu/acre)	151	143	157	152	152
Test wt. (lbs/bu)	56	56	56	56	56
Moisture (%)	18.4	18.1	18.9	18.2	18.9

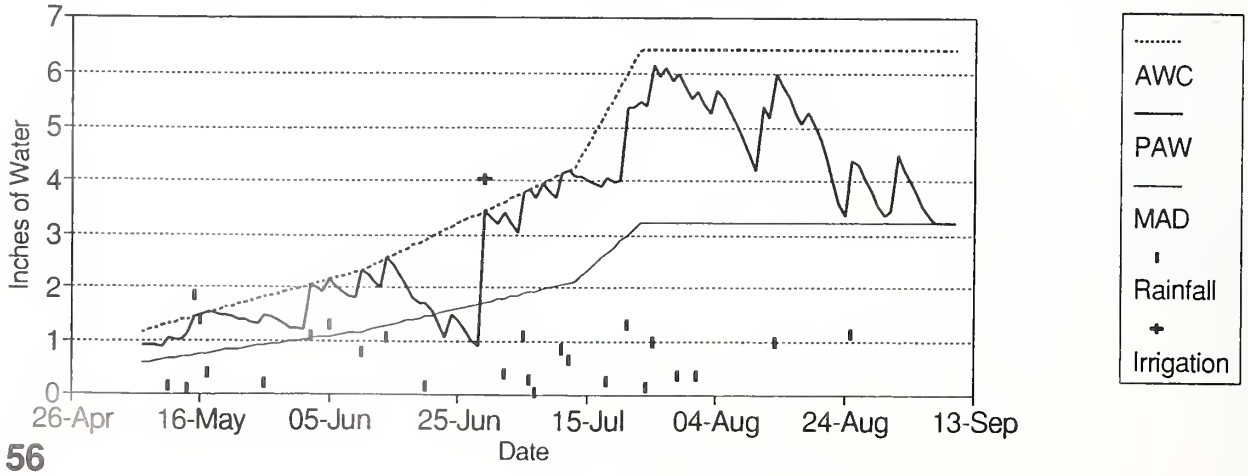
Year		Water N (lbs/acre)	Soil Res-N (lbs/acre)	N Applied (lbs/acre)	Yield (bu/acre)	3-Year Average	
	-50 A			58	152		
	-50 L			58	154		
1991	**Rec A**		**132**	**108**	**168**		
	Rec L			108	169	Avg N Applied	Avg Yield
	+50 A			158	167		
	-50 A	7		150	151	104	152
	-50 L			150	143	104	149
1992*	**Rec A**		**85**	**200**	**157**	**154**	**163**
	Rec L			200	152	154	161
	+50			250	152	204	160

** Yields were reduced in 1992 due to hail damage. Rec A = anhydrous ammonia; Rec L = liquid fertilizer*

Irrigation Management:

This site was gravity irrigated, watering alternate (every other) furrows. Clayton used a surge valve for the first time this year. Irrigation was scheduled in 1992 based on soil moisture blocks and the checkbook method. The field received 17.75 inches of rainfall between May 1 and September 9, 1992, and 4.05 inches of water were applied in one irrigation.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



Integrated Pest Management:

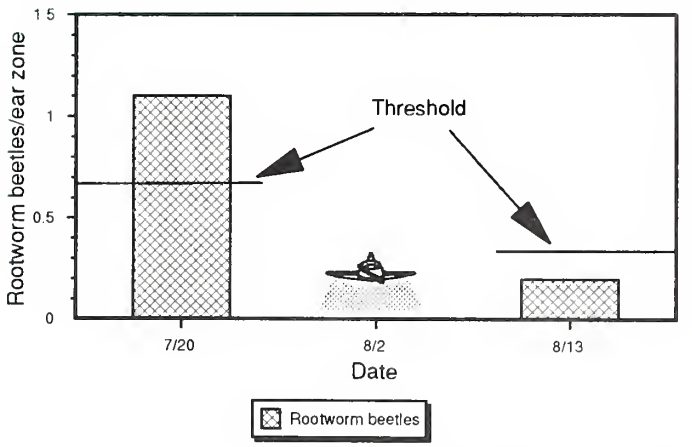
Clayton banded one pound of atrazine at planting time. The field was cultivated on June 8 and hilled on June 25.

Clayton scouted his own fields and used the beetle control program for rootworm. Soil insecticide was not used for rootworm larvae. Rootworm beetles exceeded the threshold when they reached 1.1 beetles/ear zone on July 20. He treated the field with one pint of Penncap-M on August 2. The beetle count did not increase to the threshold after the treatment.

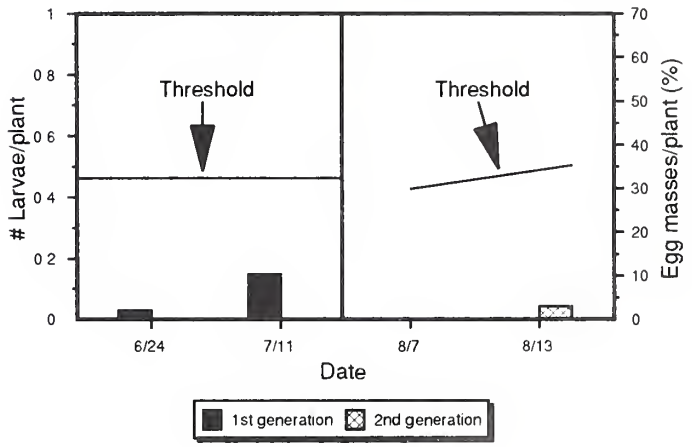
Western bean cutworm egg masses were found on four percent of the plants on July 31 (the UNL threshold is eight percent). Twenty-one percent of the plants had western bean cutworm larvae on August 7.

European corn borer never reached threshold levels for either first or second generations.

Rootworm Management

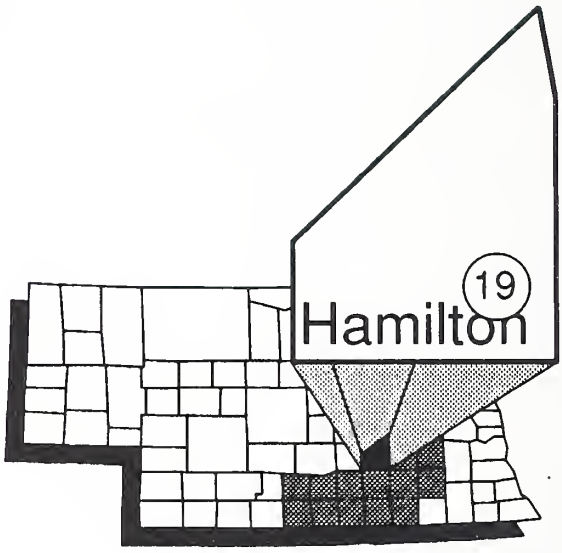


Corn Borer Management



Site 19

Carey Friesen - Hamilton County



General Information:

Site 19 is located on the Carey Friesen farm 1½ miles south of the I-80 Hampton exit in Hamilton County. This field has been in continuous corn production. The soil type is a Crete silt loam with a 0-1 percent slope.

Carey disked the field and applied NH_3 in the spring prior to planting. He planted Pioneer 3417 on the north half of the field on April 20 and on the south half on April 24 in 30-inch rows. Harvest population was 26,250 plants/acre.

Nitrogen Management:

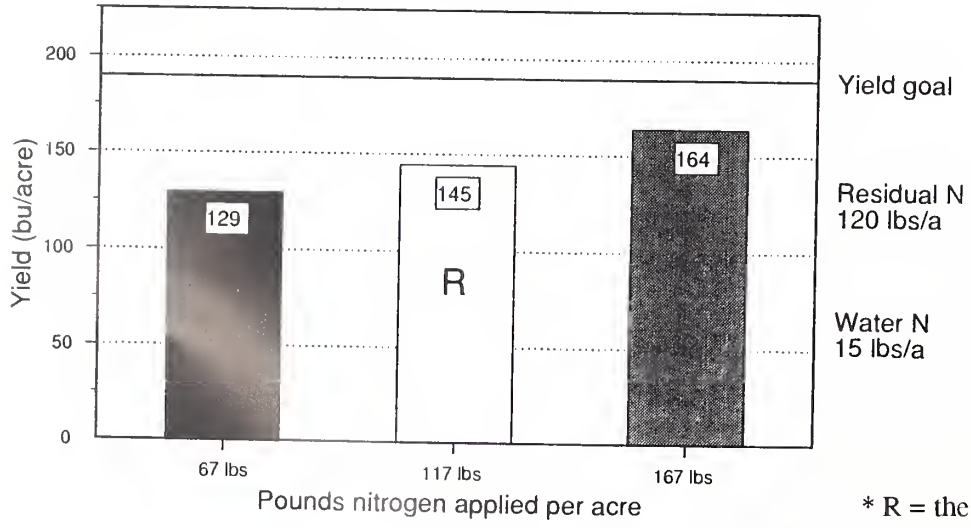
Carey included nitrogen rate comparison plots in this field. The plots were eight rows wide, 1,148 feet long, and replicated four times. The treatments are shown in the graph below. The entire amount of nitrogen was applied as anhydrous in a preplant application.

The recommended rate of nitrogen was determined using a 190-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 190 bushels of corn. A portion of the plot area was re-planted due to poor stands following wet planting conditions. Poor drainage appeared to cause a significant loss of nitrogen from denitrification. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation nitrogen accounted for 7.5 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water.

Yield Results

Yield goal: 190 bu/acre

N required for yield goal: 117 lbs/acre



* R = the UN-L recommended rate

General Fertility	
pH	6.5
OM	3.4%
P	20 ppm
K	422 ppm
Zn	0.65 ppm

Treatment	-50	Rec	+50
N rate (lbs/acre)	67	117	167
Yield avg. (bu/acre)	129	145	164
Test wt. (lbs/bu)	56	55	55
Moisture (%)	18.5	19.5	19.5

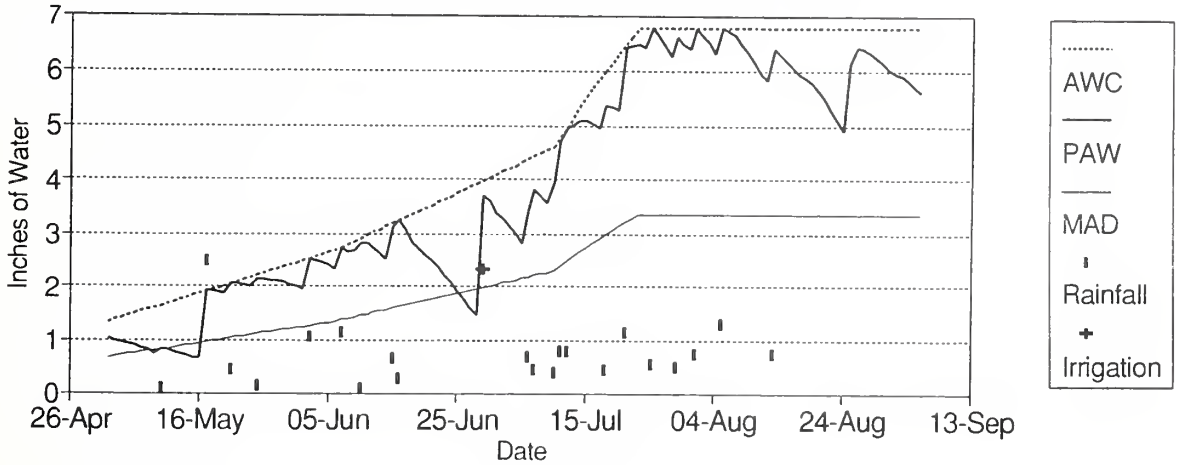
Year		Water N (lbs/acre)	Soil Res-N (lbs/acre)	N Applied (lbs/acre)	Yield (bu/acre)	2-Year Average	
	-50			115	170		
1991	**Rec**		**85**	**165**	**175**	Avg N Applied	Avg Yield
	+50			215	179		
	-50	15	85	67	129	91	150
1992*	**Rec**		**120**	**117**	**145**	**141**	**160**
	+50		129	167	164	191	172

** Yields were reduced in 1992 due to replanting and denitrification.*

Irrigation Management:

This site was gravity irrigated, watering every row. Irrigation was scheduled in 1992 based on the appearance and feel and the checkbook method. The field received 16.40 inches of rainfall between May 1 and September 9, 1992, and 2.34 inches of water were applied in one irrigation.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



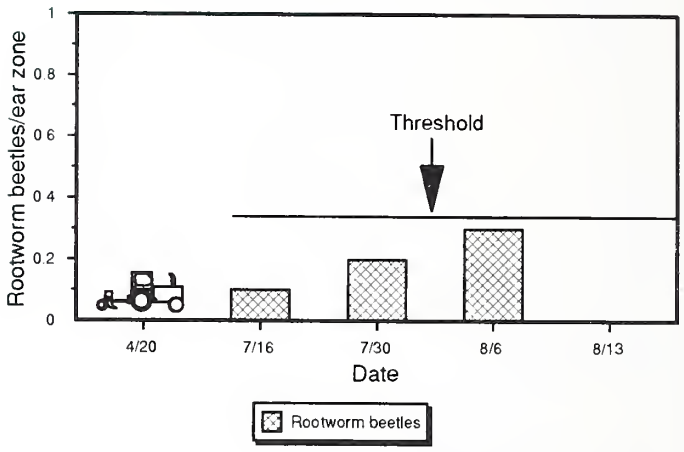
Integrated Pest Management:

Carey banded two quarts of Lariat and two pounds of atrazine at planting for sunflower and shattercane control.

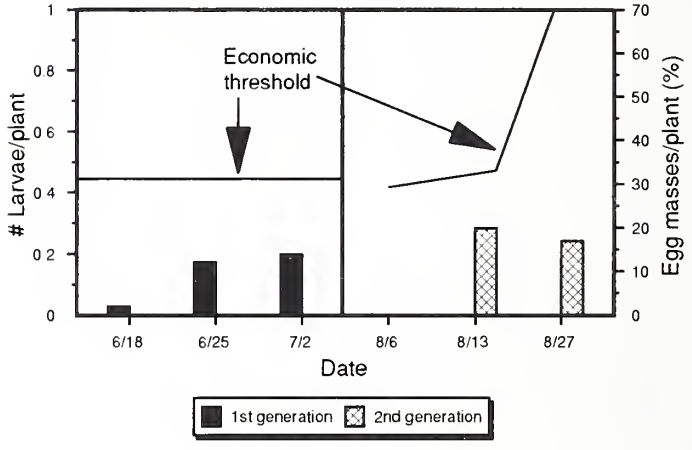
Carey utilized rootworm beetle control on some of his fields, however, this field had six pounds of Lorsban applied in a "T-band" at planting for larvae control. Rootworm beetle counts exceeded the threshold in 1991, indicating this field had a chance of having losses from rootworm larvae that would exceed the cost of treatment. Carey left three untreated check strips to evaluate that prediction. The yields are shown in Figure 5 on page 11. Beetle counts were marginal in 1992, with the highest count of .3 beetles/ear zone.

Western bean cutworm reached four percent on August 13 with the UN-L threshold of eight percent. European corn borer never reached threshold levels for first or second generations.

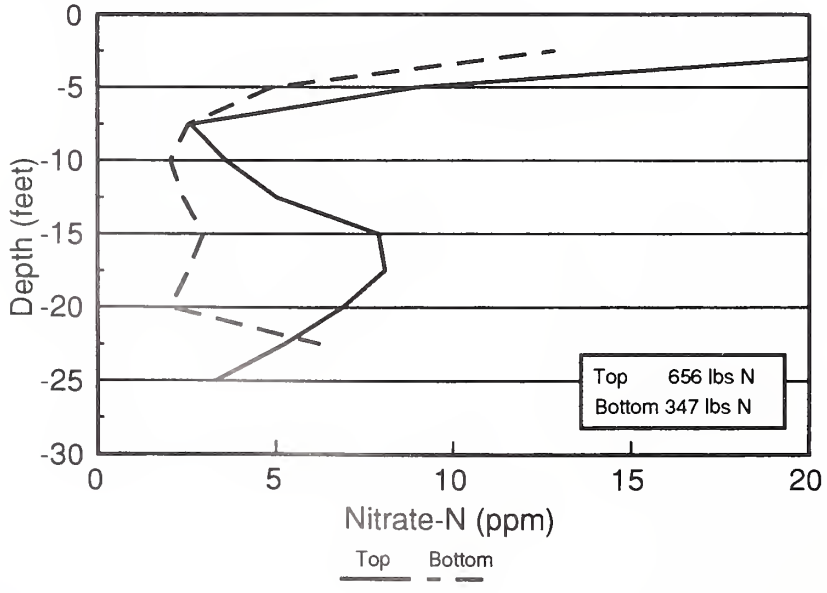
Rootworm Management



Corn Borer Management



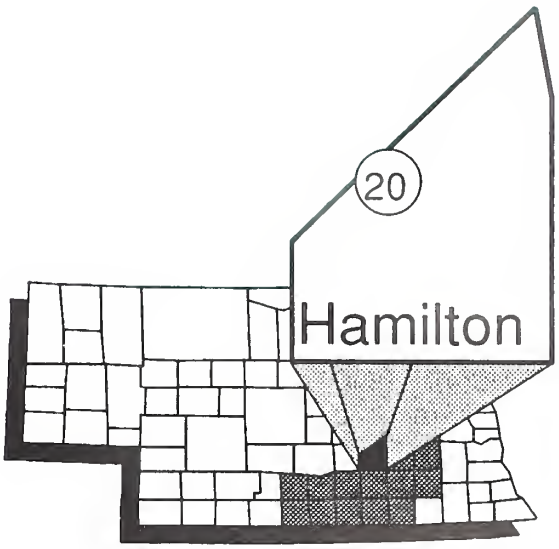
Vadose Zone Nitrate



The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

Site 20

Curt Carlson - Hamilton County



General Information:

Site 20 is located 5½ miles north of Murphy in Hamilton County on the Curt Carlson farm. This field has been in continuous corn production. The soil type is a Holder silt loam with a 0-1 percent slope.

Curt shredded the stalks and applied NH_3 down the old row prior to planting. A liquid formulation of 10-34-0 was applied at planting. Curt planted Pioneer 3162 on April 24 in 30-inch rows. Harvest population was 26,500 plants/acre.

Nitrogen Management:

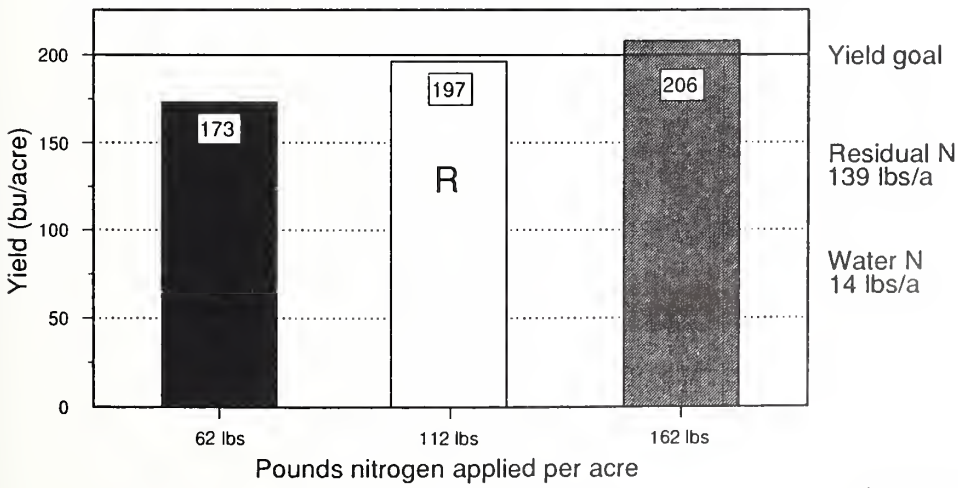
Curt included nitrogen rate comparison plots in this field. The plots were eight rows wide, 1,636 feet long and replicated four times. The treatments are shown in the graph below. The entire amount of nitrogen was applied as anhydrous in a preplant application. Five pounds was applied with the seed in the form of 10-34-0 liquid starter.

The recommended rate of nitrogen was determined using a 200-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 200 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water.

Yield Results

Yield goal: 200 bu/acre

N required for yield goal: 112 lbs/acre



* R = the UN-L recommended rate

General Fertility	
pH	6.8
OM	3.4%
P	22 ppm
K	415 ppm
Zn	2.21 ppm

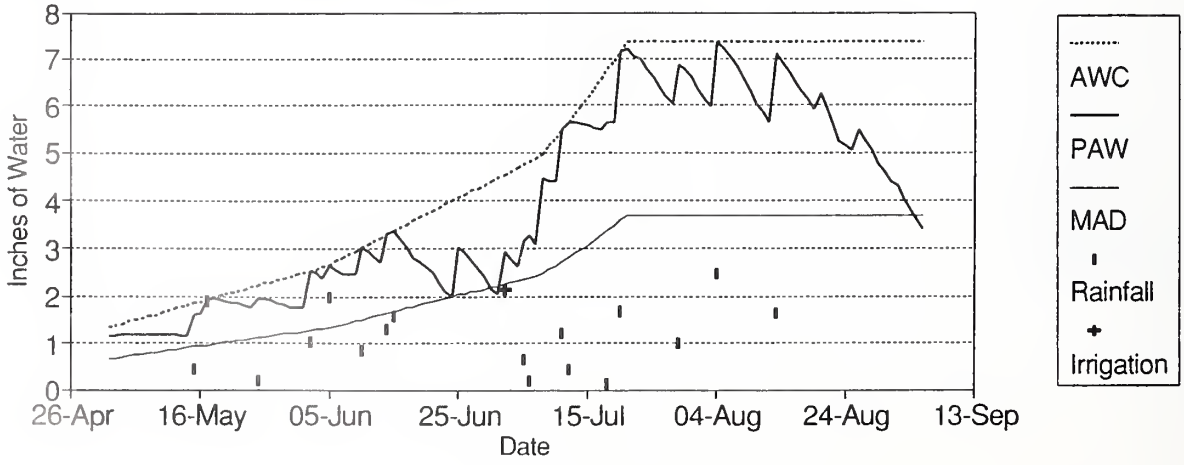
Treatment	-50	Rec	+50
N rate (lbs/acre)	62	112	162
Yield avg. (bu/acre)	173	197	206
Test wt. (lbs/bu)	55	55	55
Moisture (%)	21.3	20.8	21.5

Year		Water N (lbs/acre)	Soil Res-N (lbs/acre)	N Applied (lbs/acre)	Yield (bu/acre)	3-Year Average	
	-50	10	25	168	204		
1990	**Rec**		**36**	**218**	**204**		
	+50		45	268	206		
	-100	16	37	121	208		
1991	-50		28	171	213	Avg N Applied	Avg Yield
	Rec		**49**	**221**	**215**		
	-50	14	116	62	173	134	197
1992	**Rec**		**116**	**112**	**197**	**184**	**205**
	+50		139	162	206	215	206

Irrigation Management:

This site was gravity irrigated, watering alternate (every other) furrows. Curt used a surge valve and diked the rows at the lower end. Irrigation was scheduled in 1992 based on the appearance and feel and the checkbook method. The field received 19.35 inches of rainfall between May 1 and September 9, 1992, and 2.15 inches of water were applied in one irrigation.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



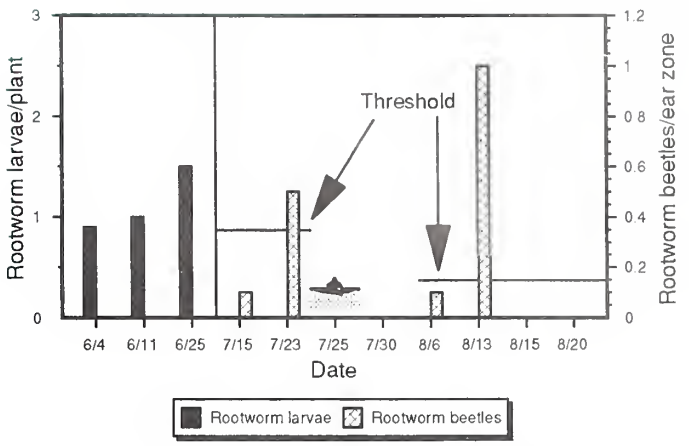
Integrated Pest Management:

Curt banded one quart of atrazine and one quart of Lariat at planting time.

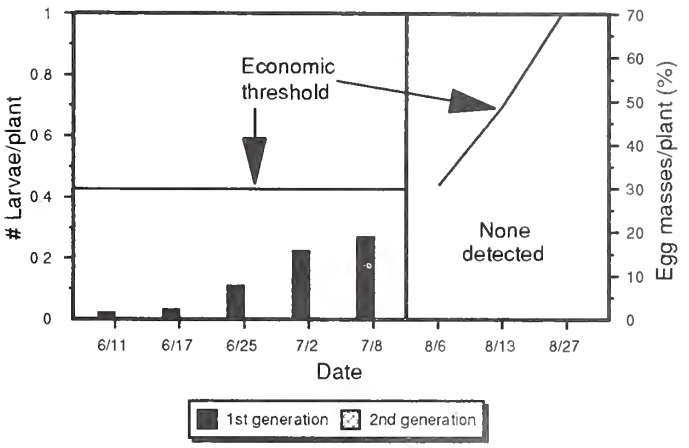
Rootworm larvae were managed with the beetle control program. Soil insecticide was not used. The threshold level of rootworm beetles was exceeded on July 23 with .5 beetles/ear zone. One pint of Penncap-M was applied on July 25. Beetle numbers rose to one beetle/plant on August 13, justifying re-treatment with one pint of Penncap-M.

First-generation European corn borer was marginal as it reached the threshold for ground treatment on July 8 but was low enough to make aerial treatment less than profitable. Second-generation borer numbers never reached the threshold.

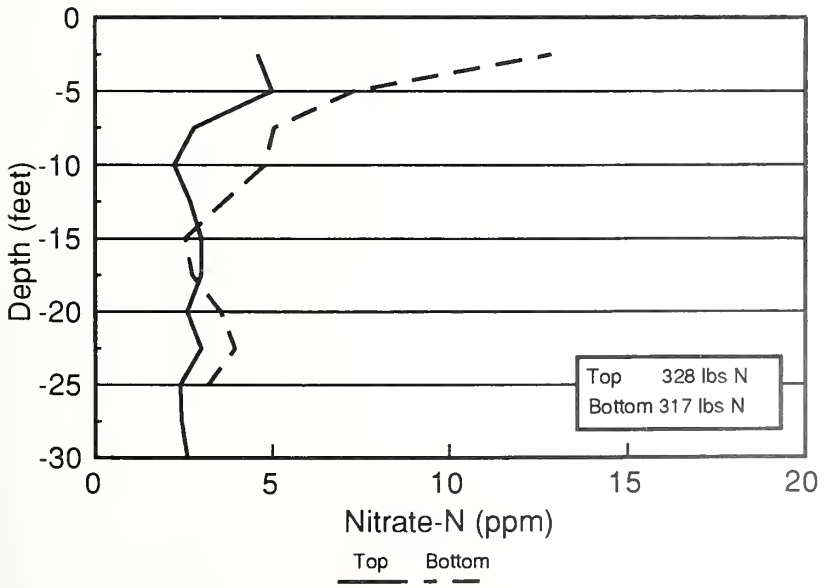
Rootworm Management



Corn Borer Management



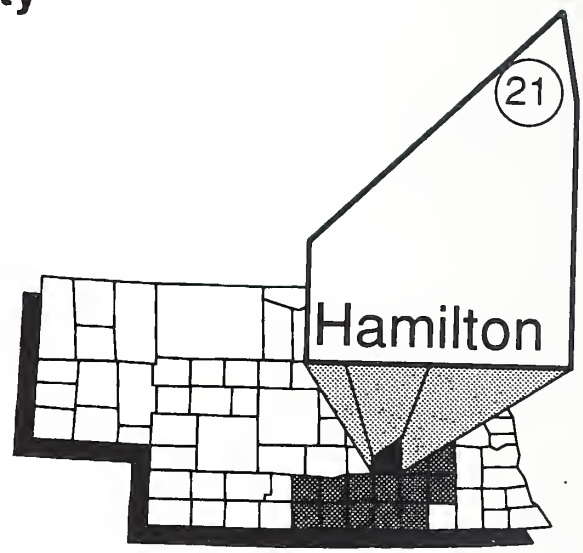
Vadose Zone Nitrate



The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

Site 21

Joel Anderson - Hamilton County



General Information:

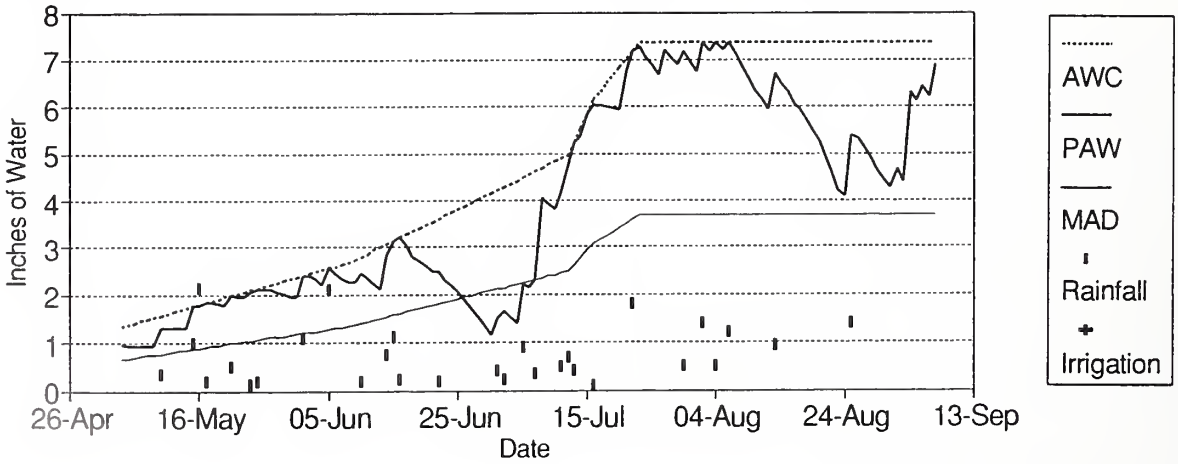
Site 21 is located on the Joel Anderson farm three miles east and two miles south of Hordville in Hamilton County. The soil type is a Holder silt loam with a 0-1 percent slope.

Because Joel ridge-tills, the only soil preparation prior to planting was to shred the stalks and apply NH_3 down the old row. Pioneer 3162 was ridge-planted on April 26 in 36-inch rows and a liquid formulation of 28-0-0 starter fertilizer was banded at planting time.

Irrigation Management

This site is gravity irrigated, watering every row. Irrigation was scheduled in 1992 based on the appearance and feel and the checkbook method. The field received 23.95 inches of rainfall between May 1 and September 9, 1992, and Joel did not irrigate this season.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



Integrated Pest Management:

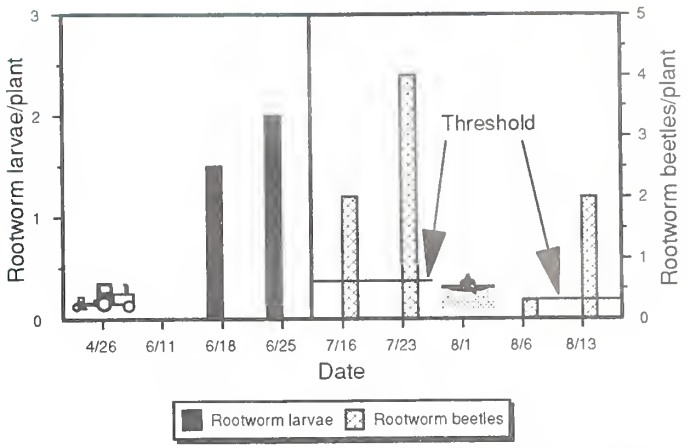
Joel banded 1.5 quarts of atrazine at planting. He cultivated on June 10 and hilled on June 21.

Rootworm larvae were managed with six pounds of Counter at planting time. Rootworm beetles exceeded the threshold when they reached two beetles/plant on July 16. This indicated that he has a chance of rootworm larvae causing more damage than the cost of treatment in 1993 if he plants corn.

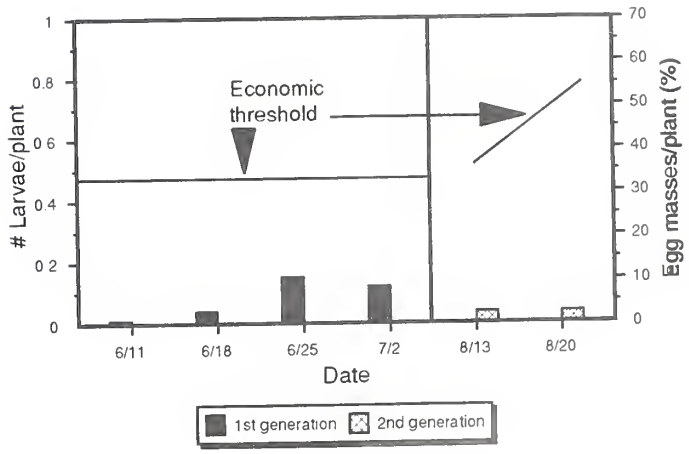
Western bean cutworm reached high levels this year with 21 percent of the plants having egg masses on July 16. Joel treated with four ounces of Pounce on August 1. Control of the cutworm was good and rootworm beetles were also reduced, but they increased above the threshold on August 13.

European corn borer never reached threshold levels for either first or second generations.

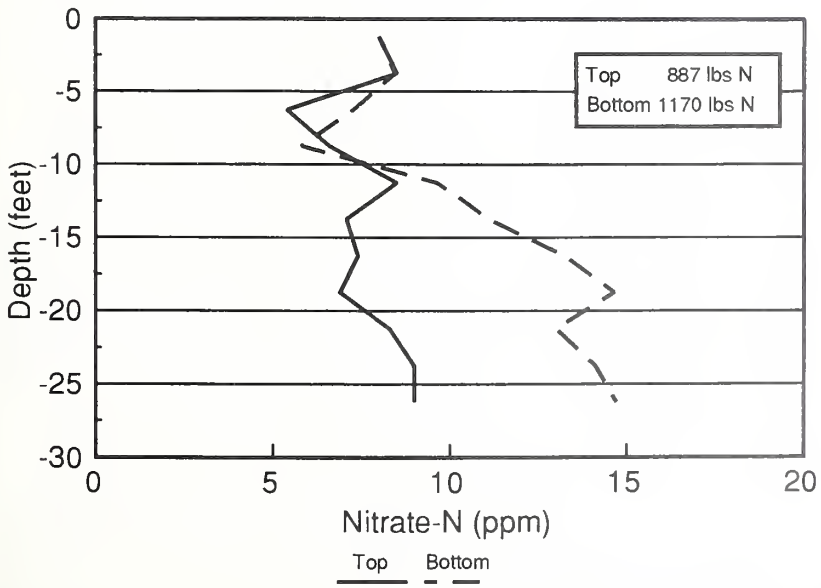
Rootworm Management



Corn Borer Management



Vadose Zone Nitrate



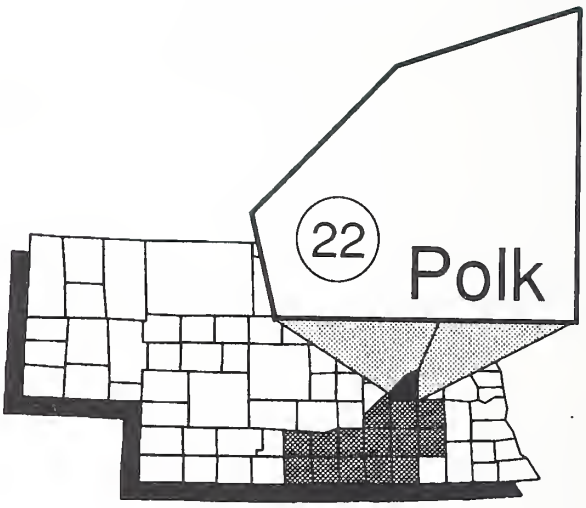
The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

Site 22

Mark Newcomer - Polk County

General Information:

Site 22 is located on the Mark Newcomer farm two miles south and three miles east of Stromsburg in Polk County. Mark's site rotates between a corn/soybean rotation field and a continuous corn field. This year's plots were on the corn/soybean rotation field. The soil type is a Hastings silt loam with a 0-1 percent slope.



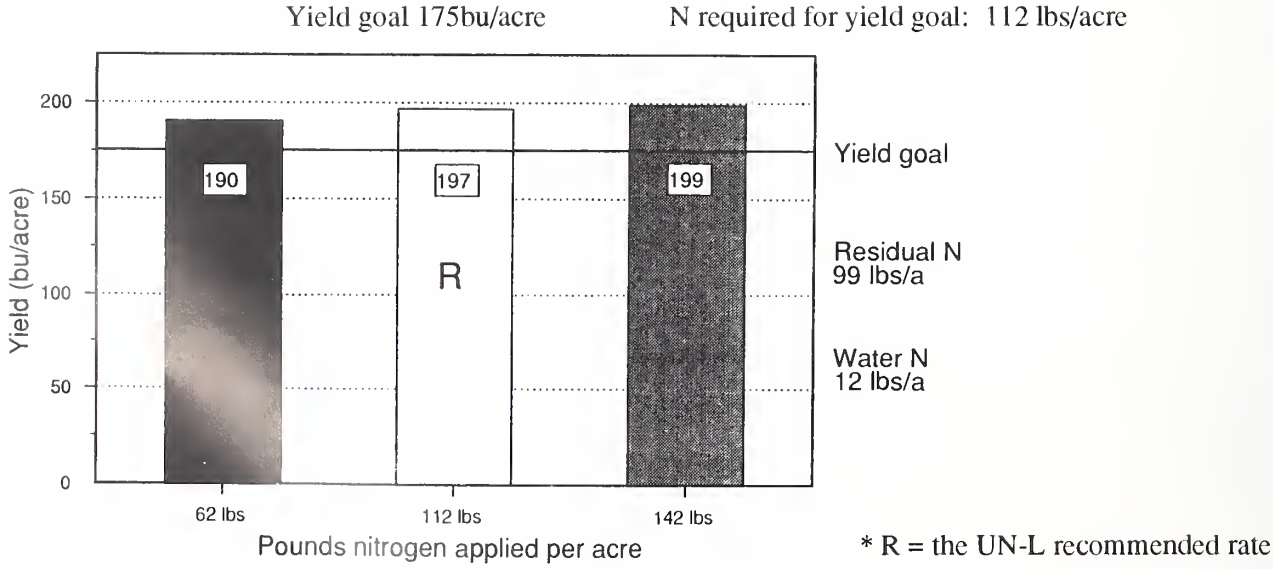
Mark shredded stalks in the fall before planting his ridge-till plot in 36-inch rows on April 23 using Pioneer 3162 seed. He fertilized with NH_3 as a sidedress application on May 27. Harvest population was 27,750 plants/acre.

Nitrogen Management:

Mark included nitrogen rate comparison plots in this field. The plots were 14 rows wide, of varied length, and replicated four times. The treatments are shown in the graph below. The entire amount of nitrogen was applied as anhydrous in a sidedress application.

The recommended rate of nitrogen was determined using a 175-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 175 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation nitrogen accounted for 5.9 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water.

Yield Results



* R = the UN-L recommended rate

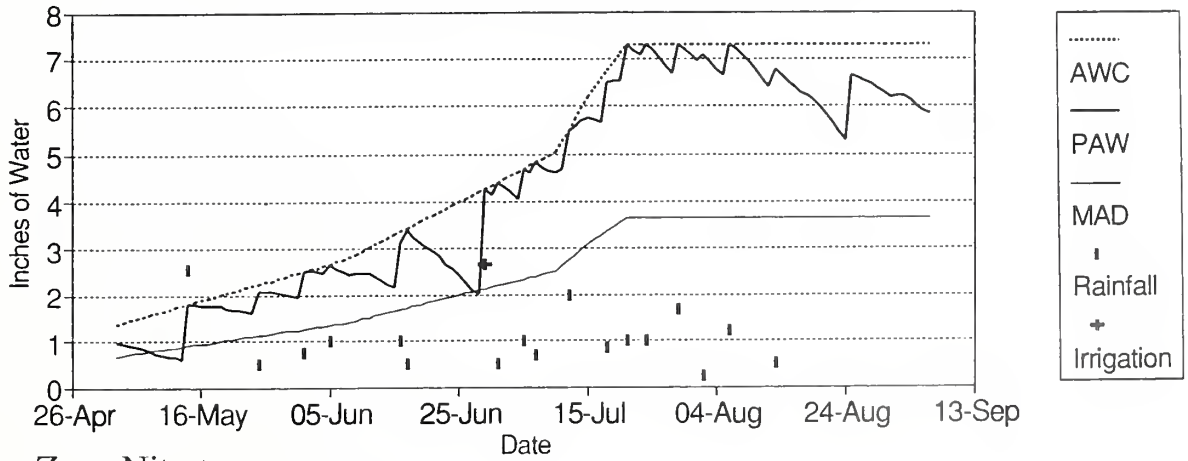
General Fertility	
pH	6.3
OM	1.8%
P	25 ppm
K	491 ppm
Zn	1.1 ppm

Treatment	-50	Rec	+50
N rate (lbs/acre)	62	112	142
Yield avg. (bu/acre)	190	197	199
Test wt. (lbs/bu)	55	54	54
Moisture (%)	21.3	21.2	21.3

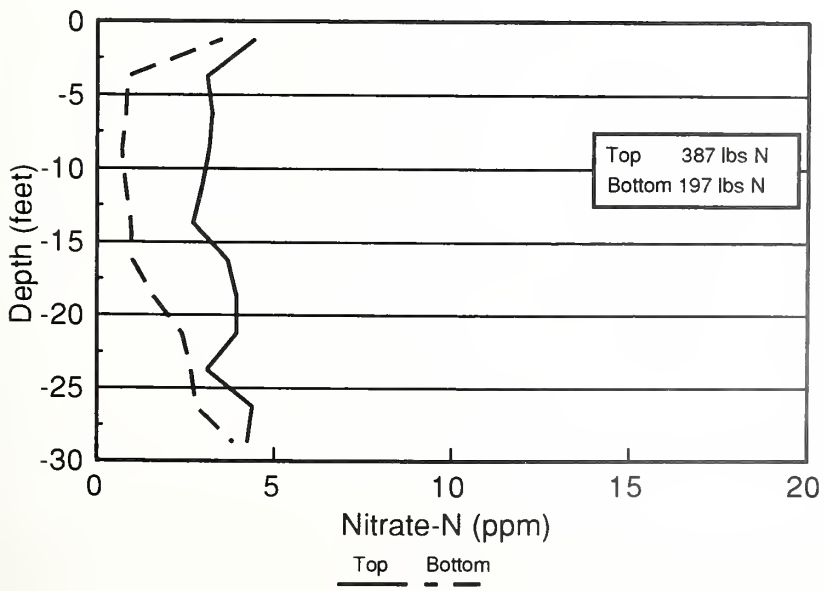
Irrigation Management:

This site was gravity irrigated, watering alternate (every other) furrows. Mark used a surge valve. Irrigation was scheduled in 1992 using soil moisture blocks and the checkbook method. The field received 18.70 inches of rainfall between May 1 and September 9, 1992, and 2.67 inches of water were applied in one irrigation.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



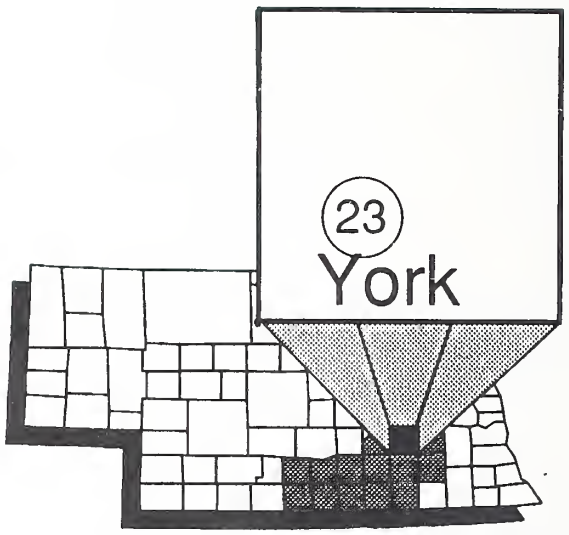
Vadose Zone Nitrate



The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

Site 23

Jerry Stahr - York County



General Information:

Site 23 is located on the Jerry Stahr farm one mile east of the York junction of Highways 81 and 34 in York County. This pivot-irrigated farm has been in continous corn production. The soil type is a Hastings silt loam with a 0-1 percent slope.

Jerry applied NH_3 and shredded stalks on April 15. He planted Golden Harvest 2525 in 30-inch rows and applied a starter fertilizer on April 28. Harvest population was 24,500 plants/acre.

Nitrogen Management:

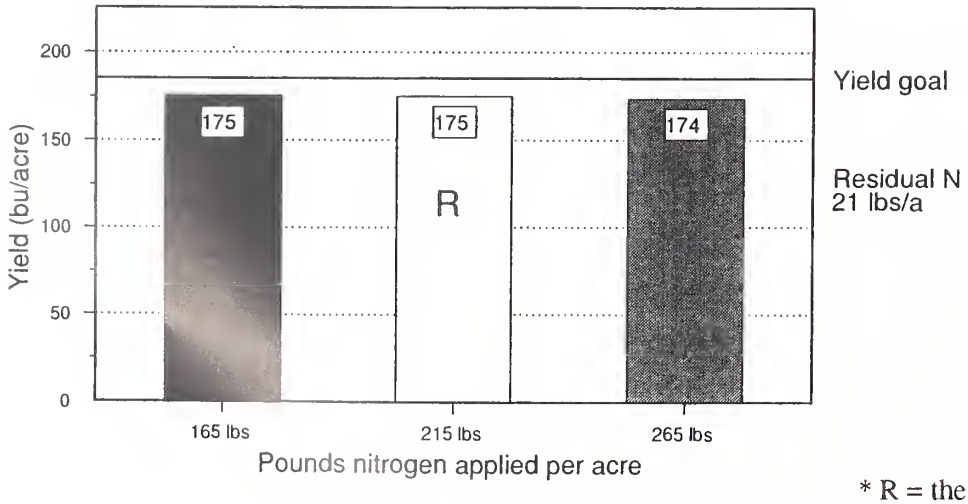
Jerry included nitrogen rate comparison plots in this field. The plots were eight rows wide, 2,550 feet long, and replicated four times. The treatments are shown in the graph below. The entire amount of nitrogen was applied as anhydrous on April 15, except for five pounds that was applied with the seed in the form of 10-34-0 liquid starter.

The recommended rate of nitrogen was determined using a 185-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 185 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation nitrogen accounted for 4.9 ppm nitrate nitrogen in samples drawn in 1991. Irrigation water credit is calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application of nine inches of water.

Yield Results

Yield goal: 185 bu/acre

N required for yield goal: 215 lbs/acre



* R = the UN-L recommended rate

General Fertility	
pH	6.5
OM	3.4%
P	18 ppm
K	292 ppm
Zn	0.56 ppm

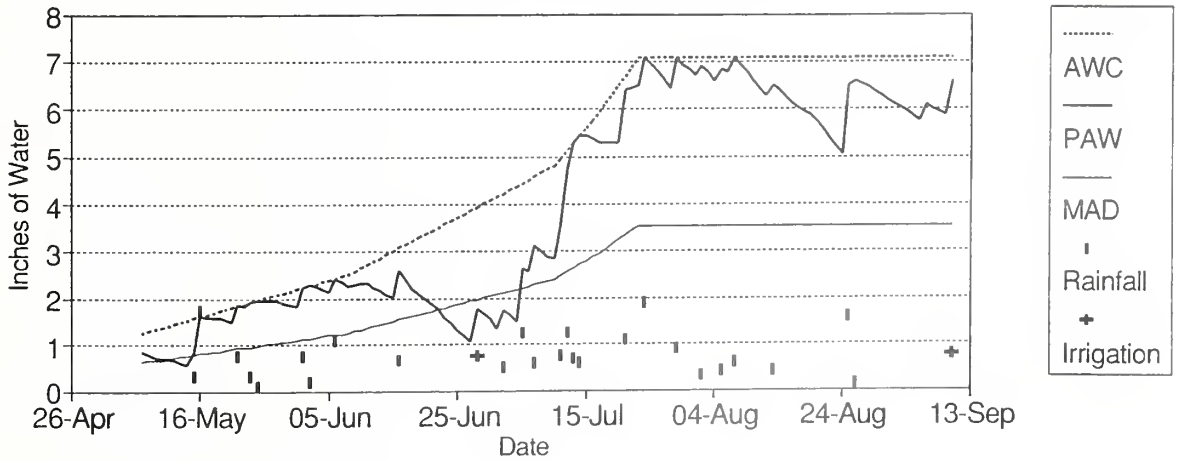
Treatment	-50	Rec	+50
N rate (lbs/acre)	165	215	265
Yield avg. (bu/acre)	175	175	174
Test wt. (lbs/bu)	n/a	n/a	n/a
Moisture (%)	18.0	17.7	18.0

Year		Water N (lbs/acre)	Soil Res-N (lbs/acre)	N Applied (lbs/acre)	Yield (bu/acre)	2-Year Average	
	-50			105	190		
1991	**Rec**		**88**	**155**	**193**	Avg N Applied	Avg Yield
	+50			205	197		
	-50	10	14	165	175	135	183
1992	**Rec**		**19**	**215**	**175**	**185**	**184**
	+50		21	265	174	235	186

Irrigation Management:

This site was pivot irrigated. Irrigation was scheduled in 1992 using soil moisture blocks and the checkbook method. The field received 19.10 inches of rainfall between May 1 and September 9, 1992, and 1.50 inches of water were applied in two irrigations.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



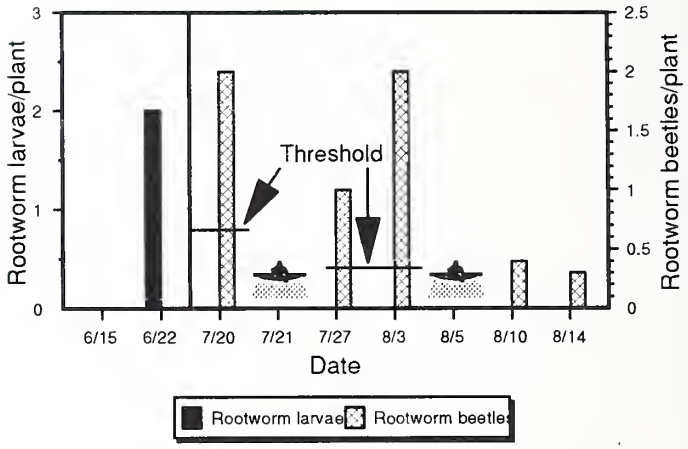
Integrated Pest Management:

Jerry banded two pints of Bicep at planting time. He cultivated the field once on June 10.

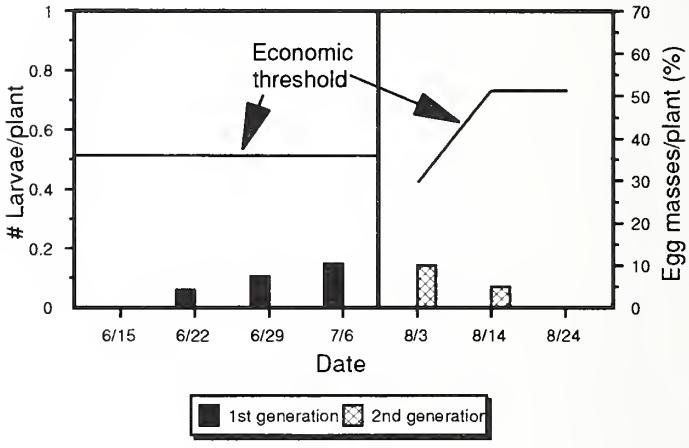
Rootworm larvae were managed with the beetle control program. Soil insecticide was not used. The rootworm beetle threshold was exceeded on July 20 with two/plant. Jerry treated with two pints Penncap-M on July 21. Beetle control was not good and the numbers rose to two/plant on August 3 and two pints Penncap-M were applied on August 5. While this did not eliminate beetles, the numbers never rose to the retreatment threshold of .5/plant.

European corn borer never reached threshold levels for either first or second generations.

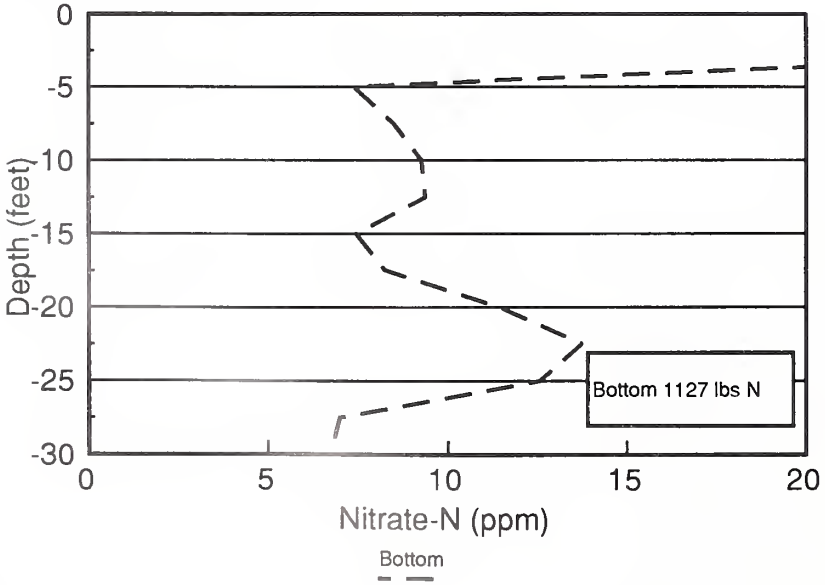
Rootworm Management



Corn Borer Management



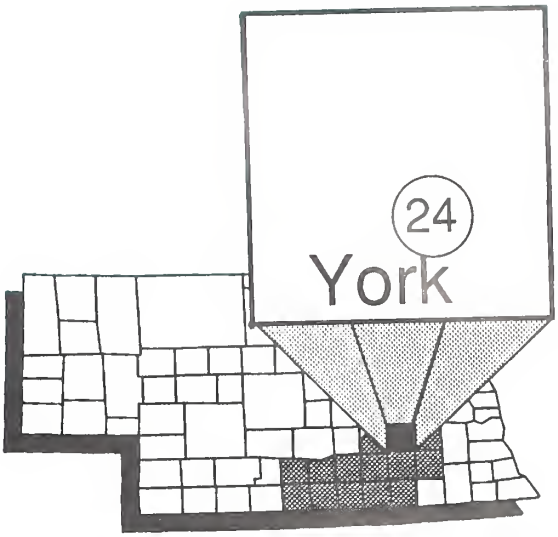
Vadose Zone Nitrate



The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

Site 24

Jerry Stahr - York County



General Information:

Site 24 is located on the Jerry Stahr farm one mile east of the York junction of Highways 81 and 34 in York County. This gravity-irrigated farm has been in continous corn production. The soil type is a Hastings silt loam with a 0-1 percent slope.

Jerry applied NH_3 on April 15 prior to shredding stalks on April 20. Jerry planted Golden Harvest 2525 in 30-inch rows on May 2 and applied a starter fertilizer. Harvest population was 24,500 plants/acre.

Nitrogen Management:

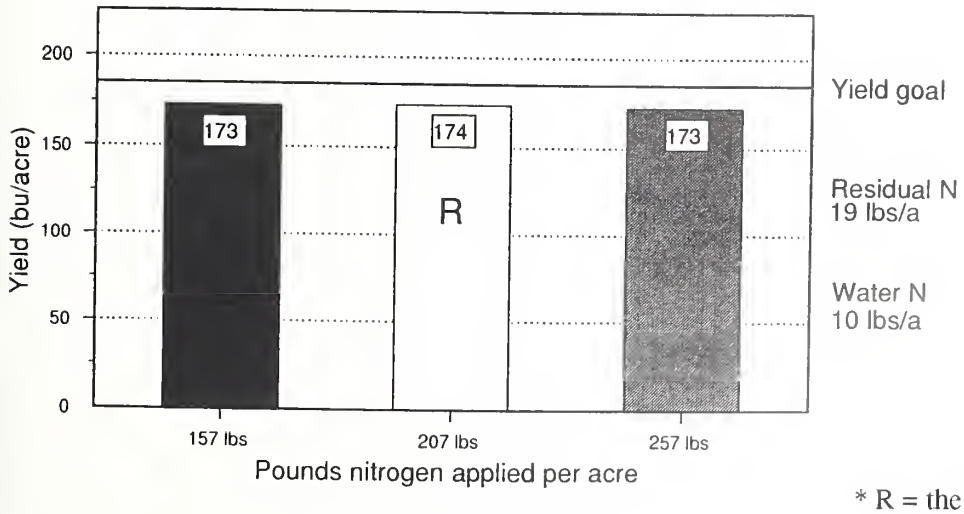
Jerry included nitrogen rate comparison plots in this field. The plots were eight rows wide, 1,244 feet long, and replicated four times. The treatments are shown in the graph below. The entire amount of nitrogen was applied as anhydrous on April 17, except for five pounds that was applied with the seed in the form of 10-34-0 liquid starter.

The recommended rate of nitrogen was determined using a 185-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 185 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation nitrogen accounted for 4.9 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water.

Yield Results

Yield goal: 185bu/acre

N required for yield goal: 207 lbs/acre



* R = the UN-L recommended rate

General Fertility	
pH	6.5
OM	3.4%
P	18 ppm
K	292 ppm
Zn	0.56 ppm

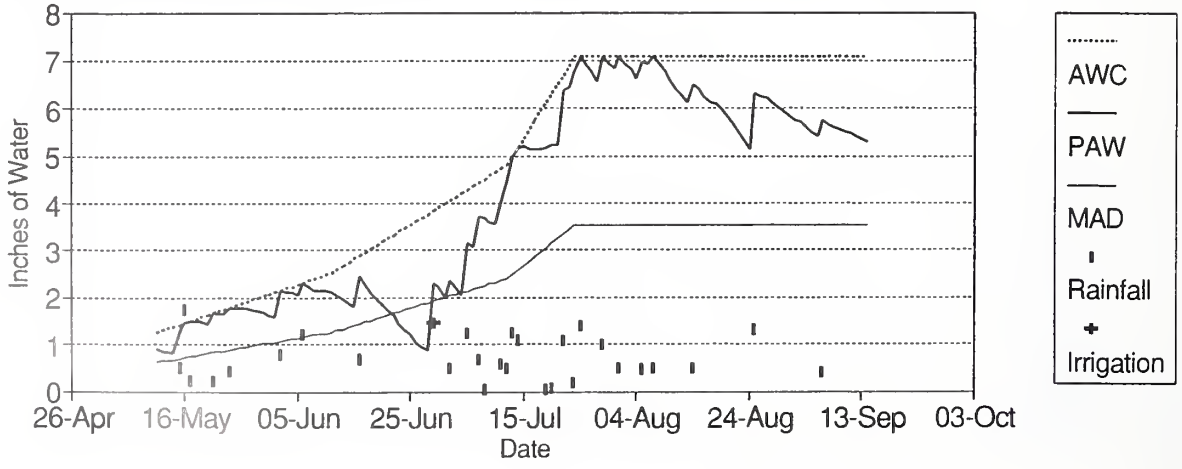
Treatment	-50	Rec	+50
N rate (lbs/acre)	157	207	257
Yield avg. (bu/acre)	173	174	173
Test wt. (lbs/bu)	n/a	n/a	n/a
Moisture (%)	19.5	19.4	19.2

Year		Water N (lbs/acre)	Soil Res-N (lbs/acre)	N Applied (lbs/acre)	Yield (bu/acre)	2-Year Average	
	-50			101	168		
1991	**Rec**		**102**	**151**	**181**	Avg N Applied	Avg Yield
	+50			201	182		
	-50	10	18	157	173	129	171
1992	**Rec**		**21**	**207**	**174**	**179**	**178**
	+50		30	257	173	229	178

Irrigation Management:

This site was gravity irrigated, watering every row. Jerry used a surge valve. Irrigation was scheduled in 1992 using soil moisture blocks and the checkbook method. The field received 19.29 inches of rainfall between May 1 and September 9, 1992, and 1.46 inches of water were applied in one irrigation.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



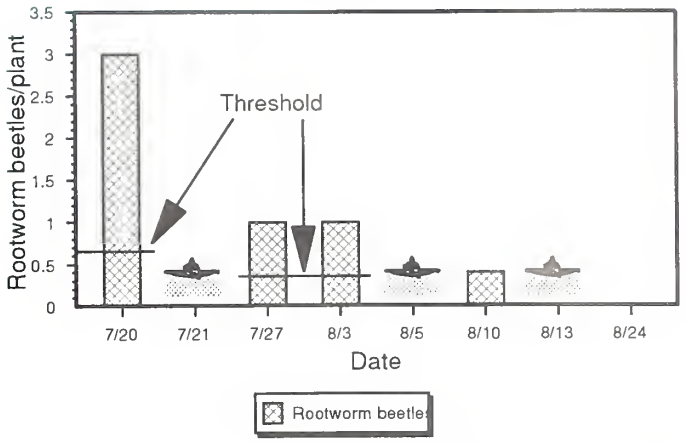
Integrated Pest Management:

Jerry banded two pints of Bicep at planting time. He cultivated the field on June 10 and hilled on June 22.

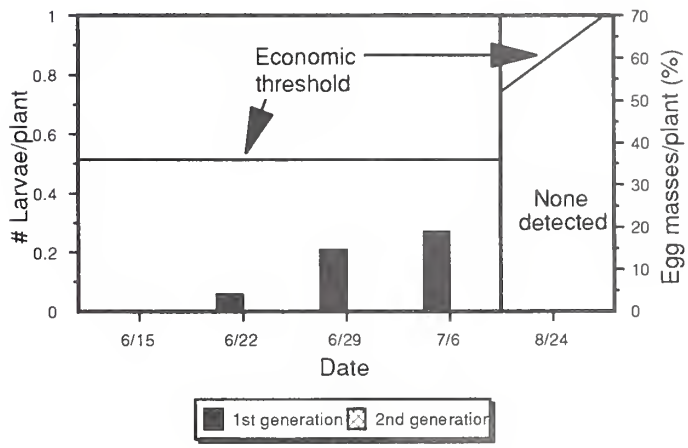
The beetle control program was used for rootworm management. Soil insecticide was not used. The rootworm beetle threshold was exceeded on July 20 with three beetles/plant. Jerry treated with two pints of Penncap-M on July 21. Beetle control was not good and the numbers rose to one beetle/plant on July 27 and two pints of Penncap-M was applied on August 5. Control was still incomplete and Jerry chose to retreat with two pints of Penncap-M on August 13 following a beetle count of .4 beetles/plant.

European corn borer never reached threshold levels for either first or second generations.

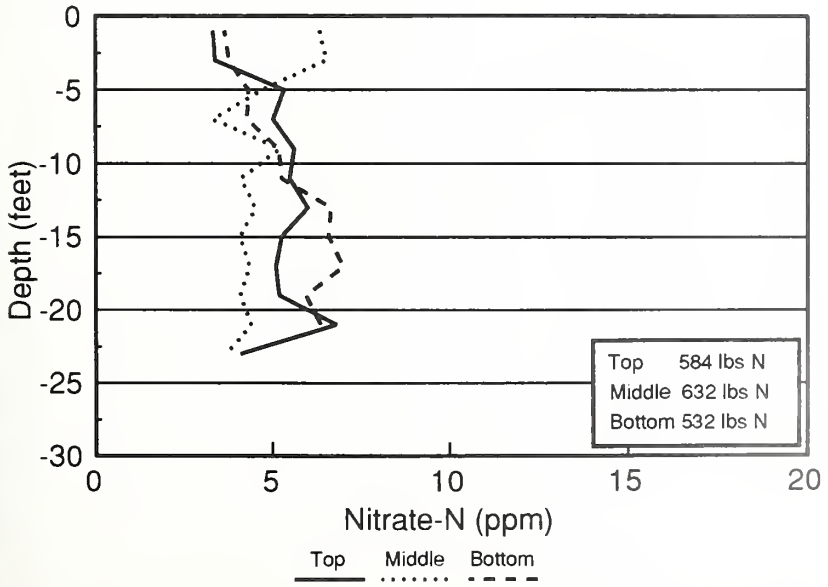
Rootworm Management



Corn Borer Management



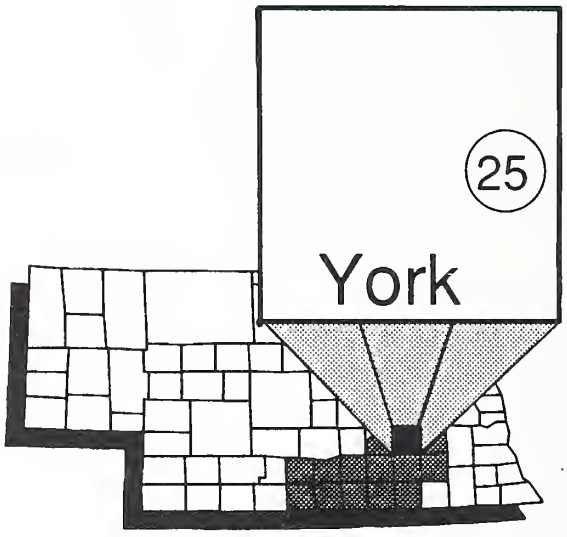
Vadose Zone Nitrate



The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

Site 25

Brad Rathje - York County



General Information:

Site 25 is located on the Brad Rathje farm one mile west of Waco in York County. The soil type is a Hastings silt loam with a 0-1 percent slope.

Brad disked prior to planting Ciba Geigy 4543 in 30-inch rows on April 28. He split-applied nitrogen in two cultivations. Harvest population was 22,500 plants/acre.

Nitrogen Management:

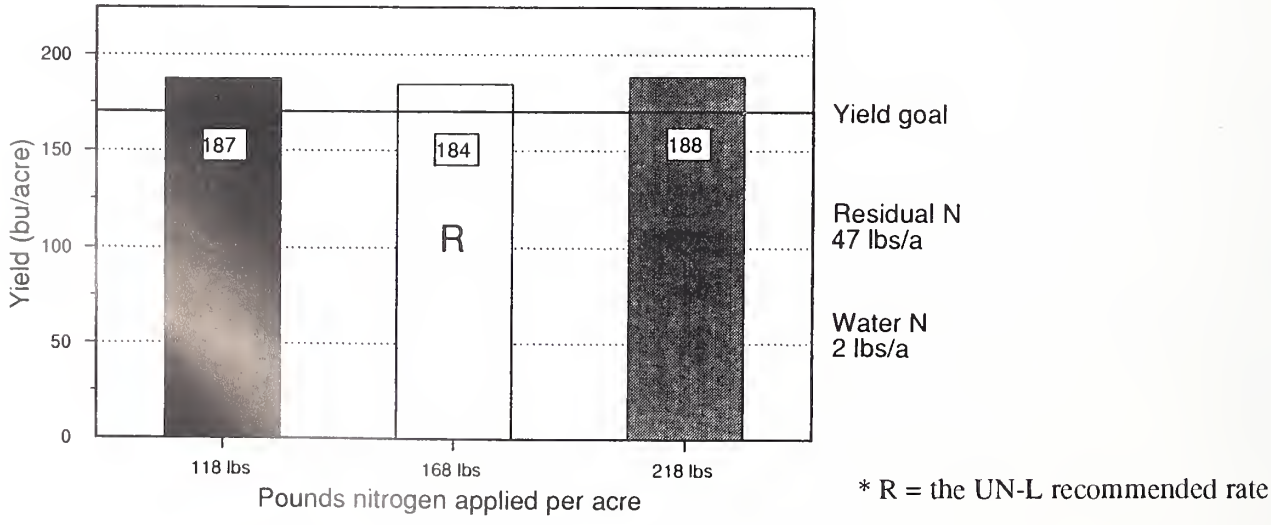
Brad included nitrogen rate comparison plots in this field. The plots were 12 rows wide, 1,000 feet long, and replicated four times. The treatments are shown in the graph below. The nitrogen was split-applied using 28-0-0 liquid in two cultivation applications: 75 pounds on June 8 and 87 pounds on June 19. Six pounds were applied with the seed in the form of 10-34-0 liquid starter.

The recommended rate of nitrogen was determined using a 170-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 170 bushels of corn. Brad changed to 30" rows this year. The soil nitrate was measured in four-feet deep soil samples taken from all the 1991 nitrogen rate strips. The irrigation nitrogen accounted for 0.9 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water.

Yield Results

Yield goal: 170 bu/acre

N required for yield goal: 168 lbs/acre



* R = the UN-L recommended rate

General Fertility	
pH	5.6
OM	2.7%
P	14 ppm
K	284 ppm
Zn	0.87 ppm

Treatment	-50	Rec	+50
N rate (lbs/acre)	118	168	218
Yield avg. (bu/acre)	187	184	188
Test wt. (lbs/bu)	55	55	55
Moisture (%)	18.8	18.9	19.0

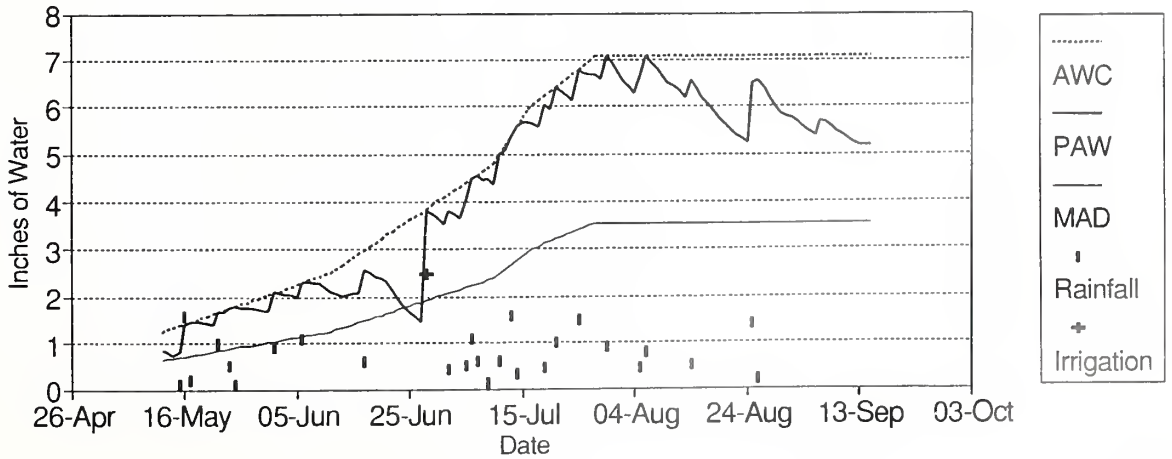
Year		Water N (lbs/acre)	Soil Res-N (lbs/acre)	N Applied (lbs/acre)	Yield (bu/acre)	3-Year Average	
	-50			135	190		
1990	**Rec**		**43**	**185**	**192**		
	+50			235	195		
	-50	3	31	120	169		
1991*	**Rec**		**52**	**170**	**171**	Avg N Applied	Avg Yield
	+50		38	220	173		
	-50	2		118	187	124	182
1992	**Rec**		**47**	**168**	**184**	**174**	**182**
	+50			218	188	224	185

** Hail and wind damage reduced yields in 1991.*

Irrigation Management:

This site was gravity irrigated, watering every furrow. Brad used a surge valve. Irrigation was scheduled in 1992 using soil moisture blocks and the checkbook method. The field received 18.55 inches of rainfall between May 1 and September 9, 1992, and 2.50 inches of water were applied in one irrigation.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



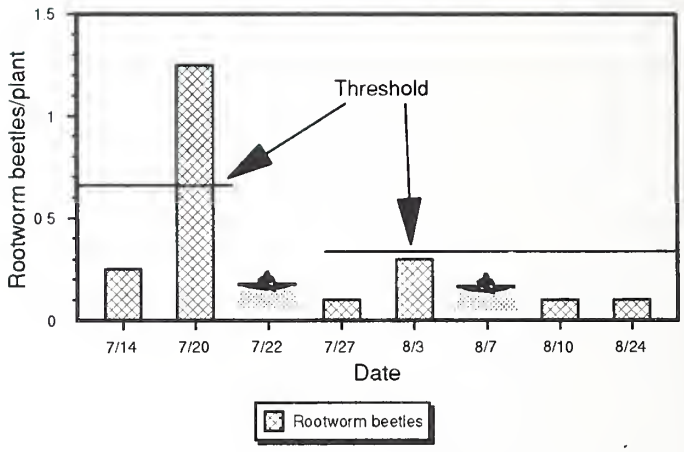
Integrated Pest Management:

Brad made a broadcast application of 1.5 pints of Dual 8E and one pint of Atrazine 4L at planting time. One-half ounce of Accent was post-applied. The field was cultivated on June 10 and hilled on June 19.

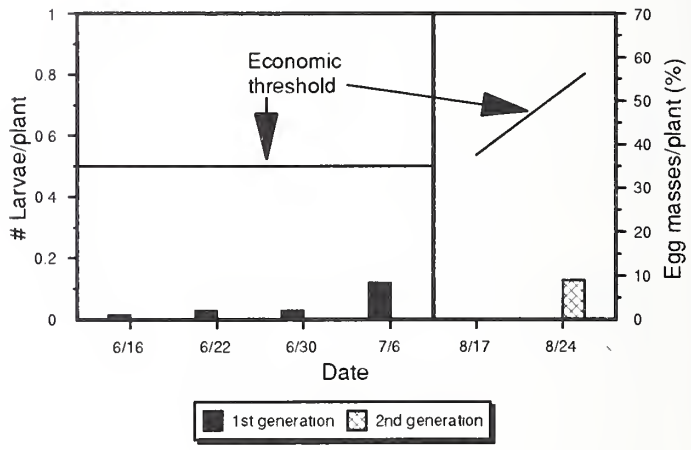
Rootworm larvae were managed with the beetle control program. Soil insecticide was not used. Using a threshold of .64 beetles/whole plant, Brad treated the field with 1.5 pints of Penncap-M on July 22 following a beetle count of 1.25/plant. A second treatment was applied on August 7 with two pints of Penncap-M when the count rose to .3/plant.

European corn borer never reached threshold levels for either first or second generations.

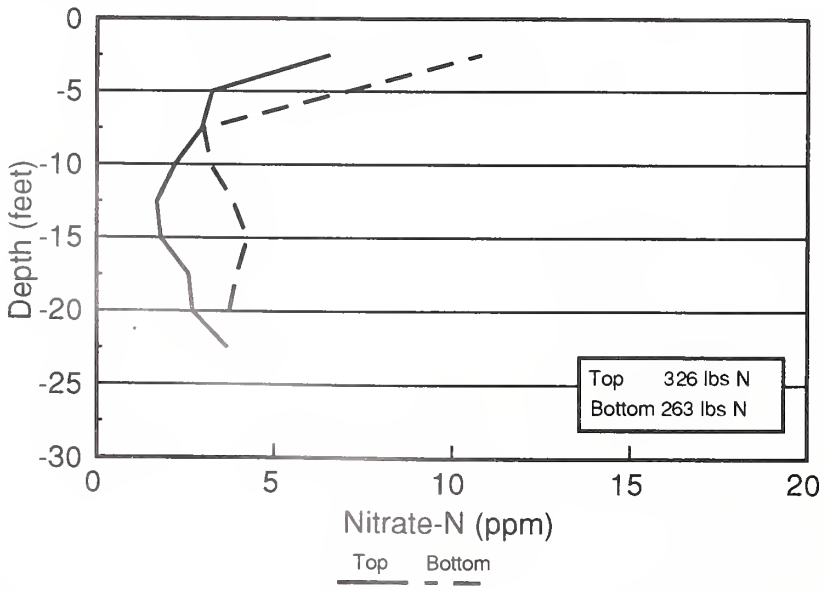
Rootworm Management



Corn Borer Management



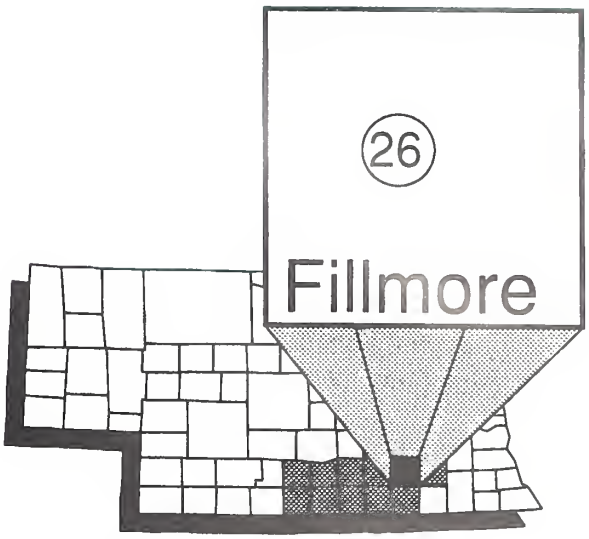
Vadose Zone Nitrate



The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

Site 26

Howard Lefler - Fillmore County



General Information:

Site 26 is located on the Howard Lefler farm two miles west and one mile south of Fairmont in Fillmore County. This pivot-irrigated farm has been in a corn/soybean rotation. This year the plot was planted to corn. The soil type is a Crete silt loam with a 0-3 percent slope.

Howard knifed in NH_3 in February prior to field-cultivating and planting Pioneer 3162 on April 15 in 30-inch rows. He also applied a starter fertilizer on April 15. Harvest population was 28,000 plants/acre.

Nitrogen Management:

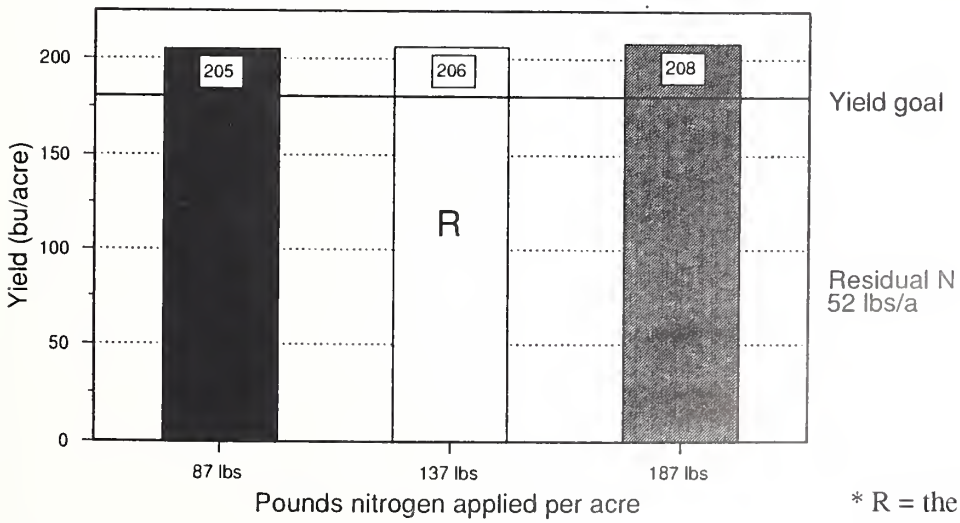
Howard included nitrogen rate comparison plots in this field. The plots were 11 rows wide, 1,310 feet long, and replicated four times. The treatments are shown in the graph below. The entire amount of nitrogen was applied as anhydrous on February 5, except for eight pounds that were applied with the seed in the form of 16-48-30-2zn liquid starter.

The recommended rate of nitrogen was determined using a 180-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 180 bushels of corn. There was also a 50-pound credit for soybeans planted on this field in 1991. The soil nitrate for this first-year plot was measured in 15 four-feet deep soil samples.

Yield Results

Yield goal: 180 bu/acre

N required for yield goal: 137 lbs/acre



* R = the UN-L recommended rate

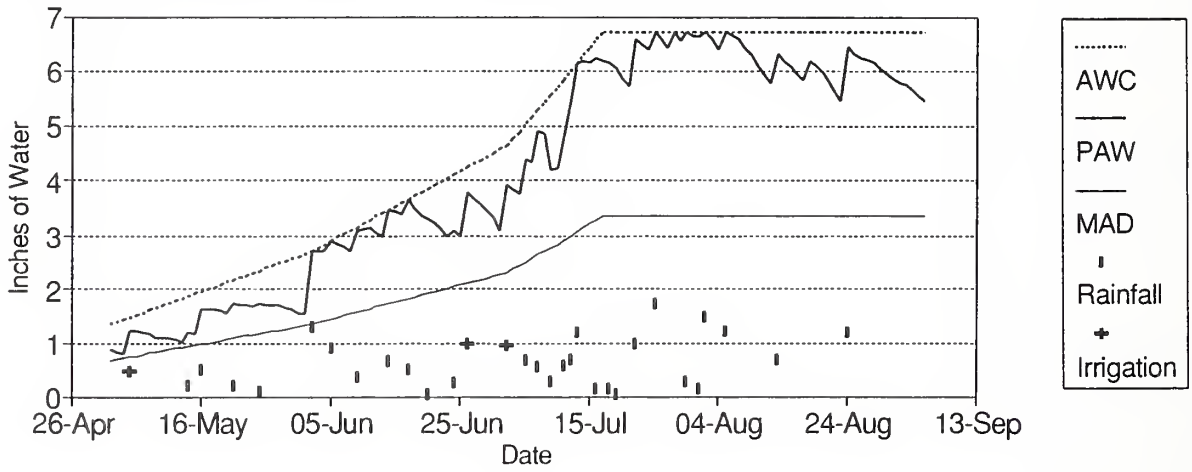
General Fertility	
pH	7.2
OM	1.4%
P	22 ppm
K	474 ppm
Zn	2.87 ppm

Treatment	-50	Rec	+50
N rate (lbs/acre)	87	137	187
Yield avg. (bu/acre)	205	206	208
Test wt. (lbs/bu)	56	56	56
Moisture (%)	20.8	20.3	19.9

Irrigation Management:

This site was pivot irrigated. Irrigation was scheduled in 1992 based on soil moisture blocks, and the check-book method. The field received 16.05 inches of rainfall between May 1 and September 9, 1992, and 2.43 inches of water were applied in three irrigations.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, as indicated by the lower line.



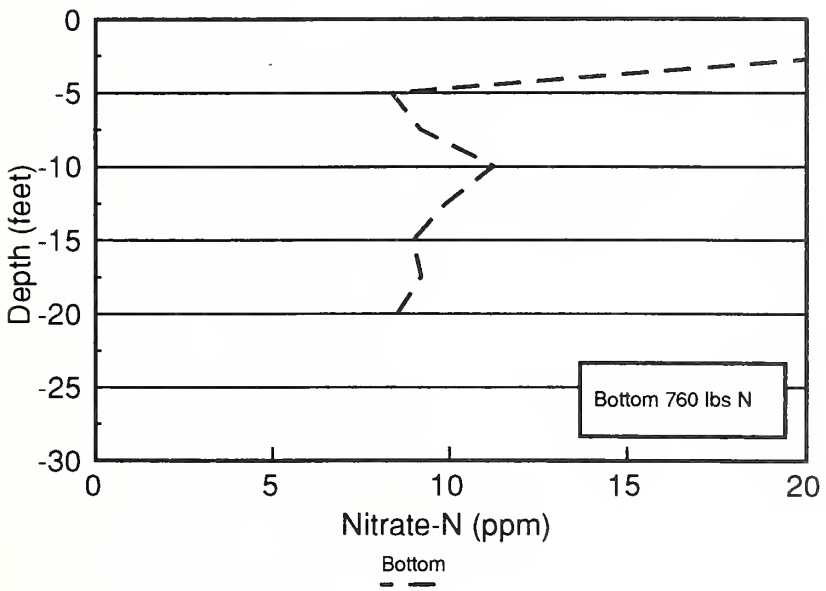
Integrated Pest Management:

Howard broadcast 1.5 quarts of atrazine ahead of the planter on April 15 and banded 1.2 quarts of Bicep at planting time. The field was cultivated on May 29 and ridged on June 18.

The rootworm larvae management program called for 8.8 pounds of Force banded at planting time. Rootworm beetle thresholds could be used to predict the need for soil insecticide in the following year if corn is planted.

European corn borer never reached threshold levels for first or second generations.

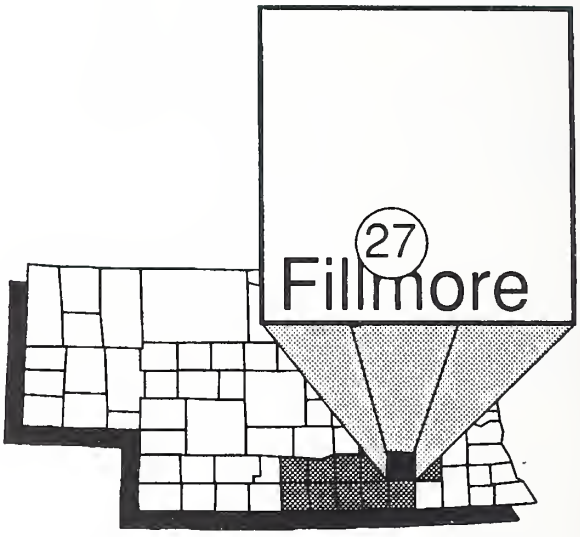
Vadose Zone Nitrate



The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

Site 27

Jim Bedlan - Fillmore County



General Information:

Site 27 is located on the Jim Bedlan farm 2½ miles west of the Strang junction of Highways 81 and 74 in Fillmore County. This field has been in continuous corn production. The soil type is a Crete silt loam with a 0-1 percent slope.

Jim shredded stalks in the fall prior to an early-February NH_3 application. He ridge-planted Pioneer 3225 in 30-inch rows on May 1-3, and applied a starter fertilizer. Harvest population was 27,300 plants/acre.

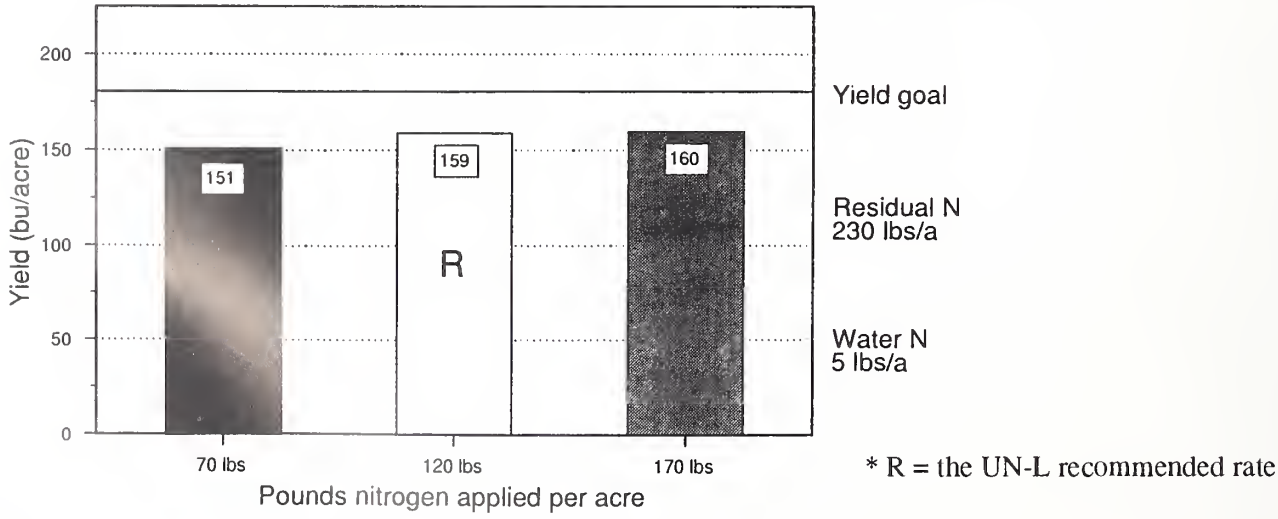
Nitrogen Management:

Jim included nitrogen rate comparison plots in this field. The plots were eight rows wide, of varied length, and replicated four times. The treatments are shown in the graph below. The entire amount of nitrogen was applied as anhydrous on April 15, except for five pounds that were applied with the seed in the form of 10-34-0 liquid starter.

The recommended rate of nitrogen was determined using a 180-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 180 bushels of corn. The soil nitrate for this first-year plot was measured in 15 four-feet deep soil samples taken from the plot area. The irrigation nitrogen accounted for 2.5 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water. Due to the extreme variability of the residual nitrate soil levels in this field, the recommended rate of supplemental nitrogen was 120 pounds. Fifteen cores were taken in the initial soil sampling process. Four of the cores required supplemental N of >120 pounds. Five of the cores revealed recommendations of 160 pounds or more. Reduced yields appear to be due to a loss of nitrogen from denitrification.

Yield Results

Yield goal: 180 bu/acre N required for yield goal: 120 lbs/acre



* R = the UN-L recommended rate

General Fertility	
pH	6.4
OM	1.5%
P	20 ppm
K	420 ppm
Zn	3.91 ppm

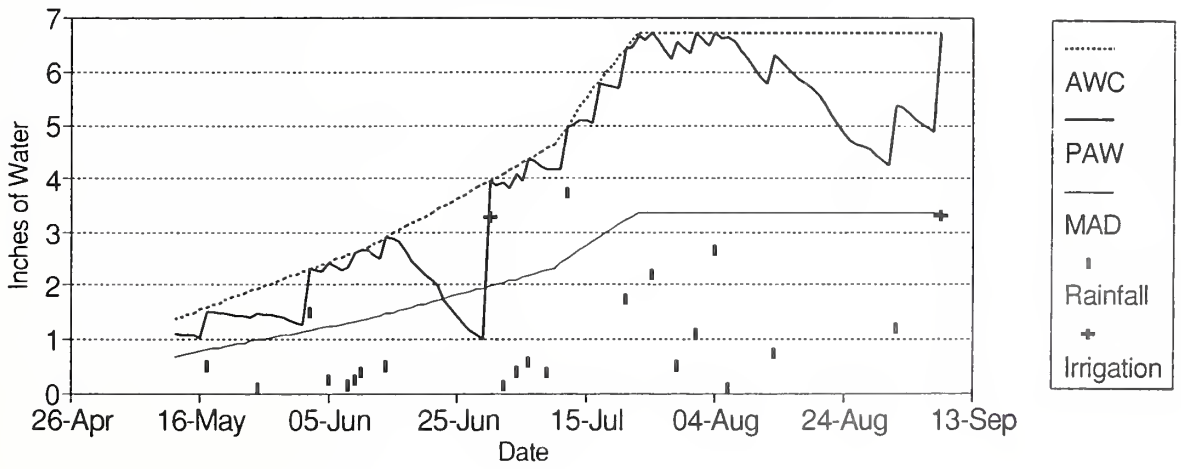
Treatment	-50	Rec	+50
N rate (lbs/acre)	70	120	170
Yield avg. (bu/acre)	151	159	160
Test wt. (lbs/bu)	60	60	59
Moisture (%)	18.3	18.0	18.5

* *Yields were reduced in 1992 due to loss of nitrogen from denitrification.*

Irrigation Management:

This site was gravity irrigated, watering every row and Jim used a surge valve on a portion of the field. Irrigation was scheduled in 1992 using appearance and feel, moisture blocks, and the checkbook method. The field received 18.25 inches of rainfall between May 1 and September 9, 1992, and 6.61 inches of water were applied in two irrigations.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



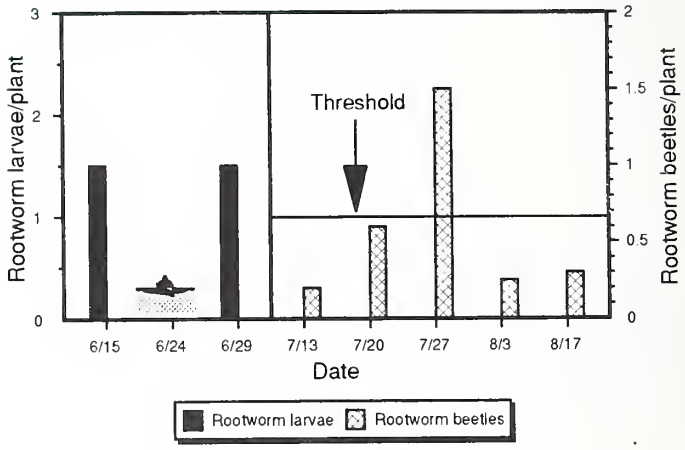
Integrated Pest Management:

Jim banded 1.5 pints of Lariat and one quart of atrazine at planting time. He broadcast three pints of Marksman for sunflowers on May 19. The field was cultivated on June 12.

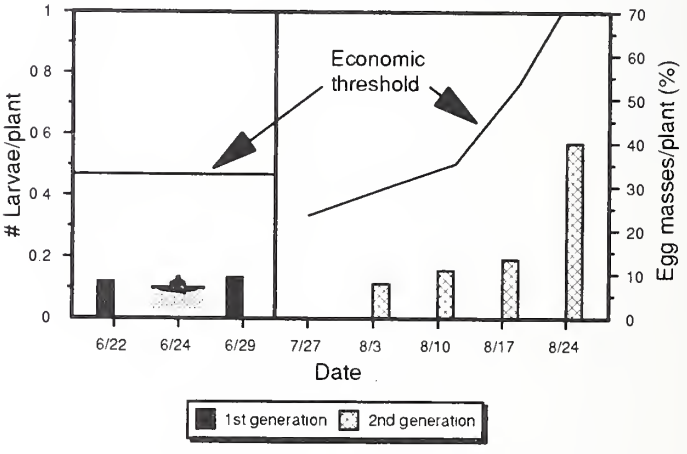
Jim considered going to the beetle control program for rootworm, but did not do so in 1992. He tried to time an aerial application of five pounds of Dyfonate II granules for rootworm larvae and first-generation European corn borer control. Rootworm beetles exceeded the threshold on July 27, indicating a chance that rootworm larvae will cause more damage than the value of treatment in 1993 if he plants corn.

The first-generation European corn borer might have exceeded the threshold without treatment, as shotholed plants reached 20 percent, but there was less than one live borer/plant on June 29. Second-generation borer numbers were high on August 24, but the advanced maturity of the corn did not warrant treatment.

Rootworm Management

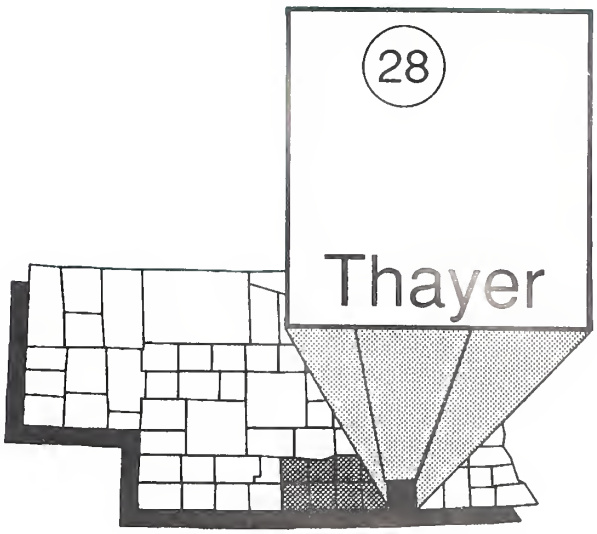


Corn Borer Management



Site 28

Leroy Voss - Thayer County



General Information:

Site 28 is located on the Leroy Voss farm 2½ miles west of Bruning in Thayer County. This gravity-irrigated farm has been in continuous corn production. The soil type is a Crete silt loam with a 0-1 percent slope.

Leroy shredded the stalks and applied NH_3 down the old row prior to planting. He used starter fertilizer at planting. Leroy planted Pioneer 3245 on April 16 in 36-inch rows. Harvest population was 24,250 plants/acre.

Nitrogen Management:

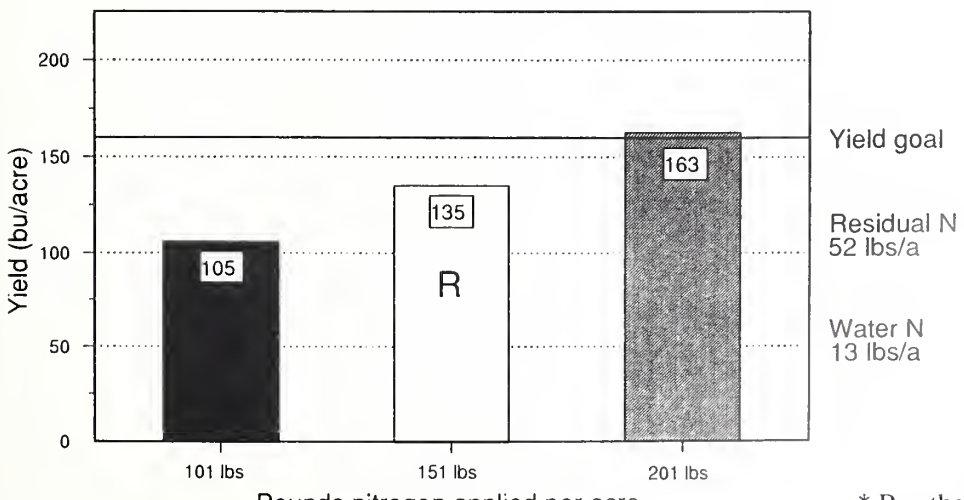
Leroy included nitrogen rate comparison plots in this field. The plots were eight rows wide, and 1,201, 1,480, and 1,458 feet long and replicated three times. The treatments are shown in the graph below. Leroy's yields were highly variable in 1992. All nitrogen was applied preplant. Anhydrous ammonia was applied in the furrow on March 3, 1992. At planting, an eight-gallon mixture of equal amounts of 28-0-0 and 10-34-0 were placed in a 2X2-inch band.

The recommended rate of nitrogen was determined using a 160-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation water nitrate from the nitrogen required for 160 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. Irrigation water nitrate accounted for 6.3 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water. Reduced yields on the minus 50 and recommended treatments appear to be due to a loss of nitrogen from denitrification.

Yield Results

Yield goal: 160 bu/acre

N required for yield goal: 151 lbs/acre



* R = the UN-L recommended rate

General Fertility	
pH	6.5
OM	3.6%
P	19 ppm
K	269 ppm
Zn	3.47 ppm

Treatment	-50	Rec	+50
N rate (lbs/acre)	101	151	201
Yield avg. (bu/acre)	105	135	163
Test wt. (lbs/bu)	56	56	56
Moisture (%)	16.1	16.3	16.1

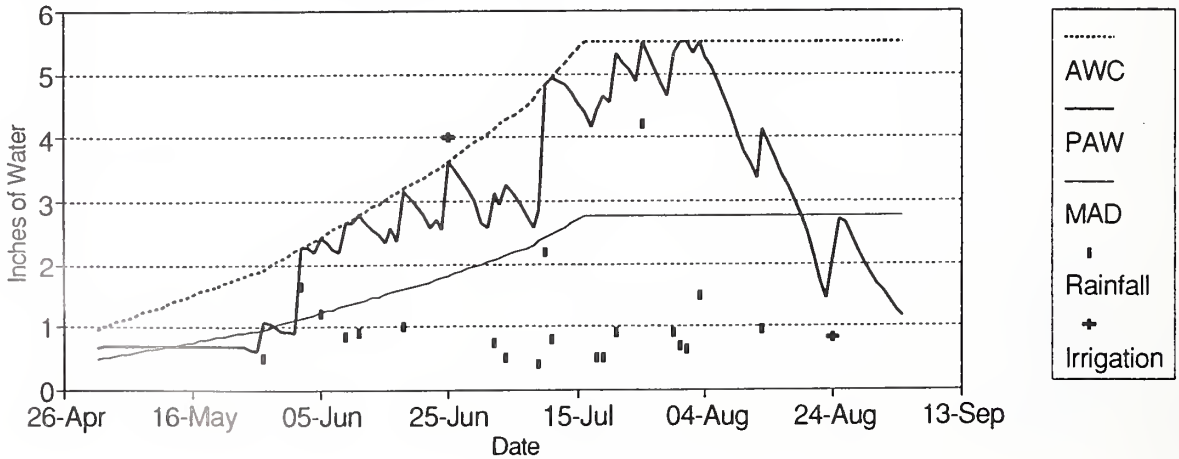
Year		Water N (lbs/acre)	Soil Res-N (lbs/acre)	N Applied (lbs/acre)	Yield (bu/acre)	2-Year Average	
	-50			67	161		
1991	**Rec**		**59**	**117**	**173**		
	Rec F			117	190	Avg N	Avg
	+50			167	183	Applied	Yield
	-50	13	16	101	105	84	133
1992*	**Rec**		**52**	**151**	**135**	**134**	**154**
	+50		60	201	163	184	173

** Yields were reduced in 1992 due to loss of nitrogen from denitrification.*

Irrigation Management:

This site was gravity irrigated, watering every furrow. Irrigation was scheduled in 1992 using the appearance and feel and the checkbook methods. Soil moisture blocks were also used to determine moisture status. The field received 22.25 inches of rainfall between May 1 and September 9, 1992, and 4.81 inches of water were applied in two irrigations.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



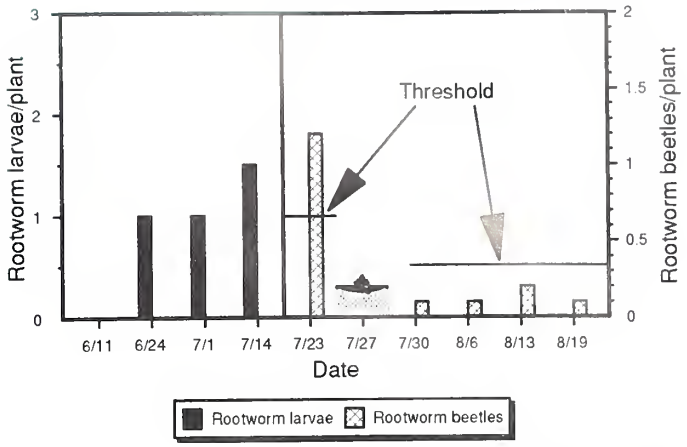
Integrated Pest Management:

Leroy banded two pints of Bicep at planting. Marksman was applied for velvetleaf and pigweed at the 3.5-pint rate on April 29. The field was hilled on June 15.

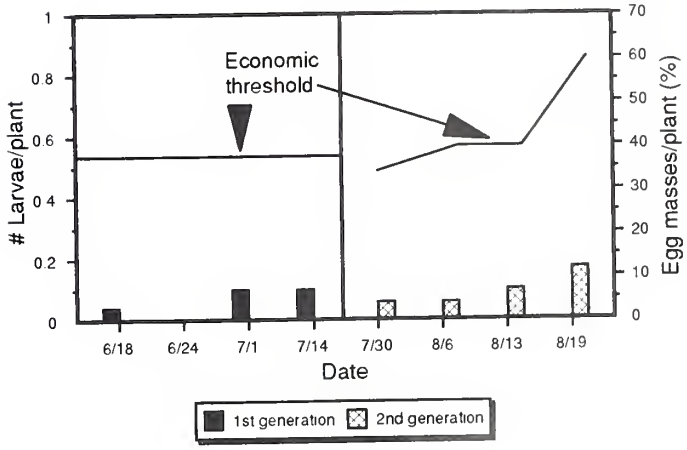
Rootworm larvae were managed with the beetle control program. The threshold was exceeded on June 24 with one beetle/ plant . Leroy had two pints of Penncap-M applied on July 27.

European corn borer did not exceed the threshold for either first or second generations.

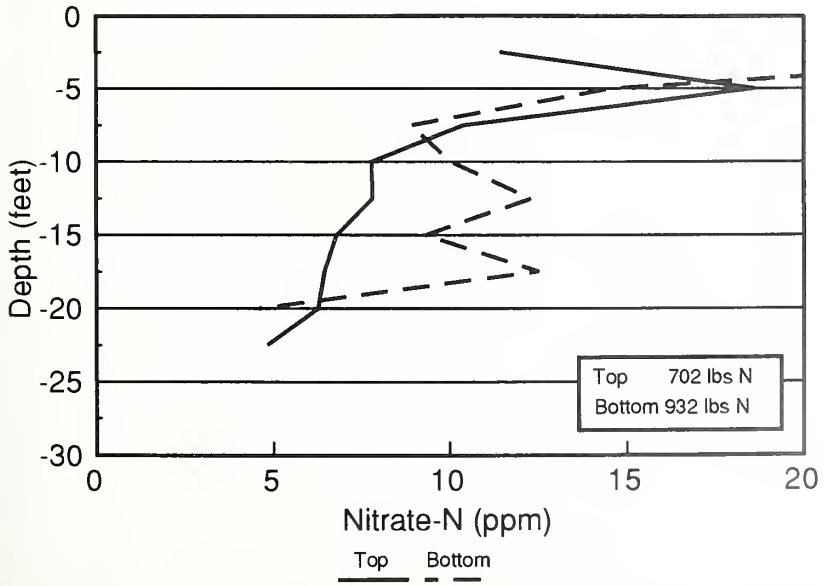
Rootworm Management



Corn Borer Management



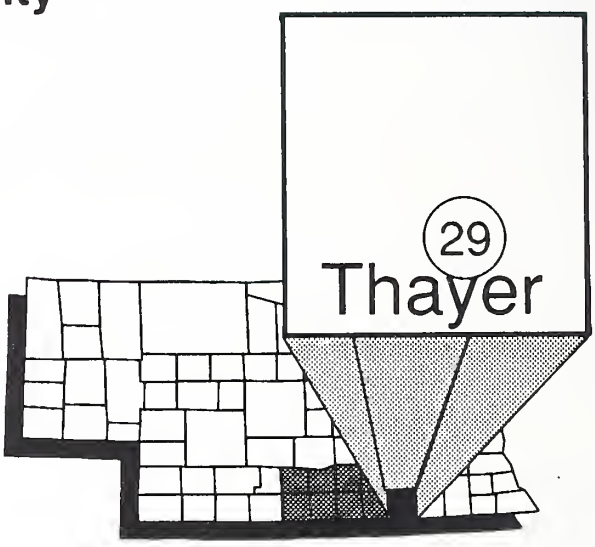
Vadose Zone Nitrate



The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

Site 29

Effenbeck Farms - Thayer County



General Information:

Site 29 is operated by Effenbeck Farms and is located two miles north of Chester in Thayer County. This pivot-irrigated field has been in continuous corn production. The soil type is a Crete silt loam with a 1-3 percent slope.

Al Effenbeck shredded stalks and applied NH_3 down the old row prior to planting. He planted Pioneer 3162 on April 29 in 30-inch rows. Harvest population was 25,800 plants/acre.

Nitrogen Management:

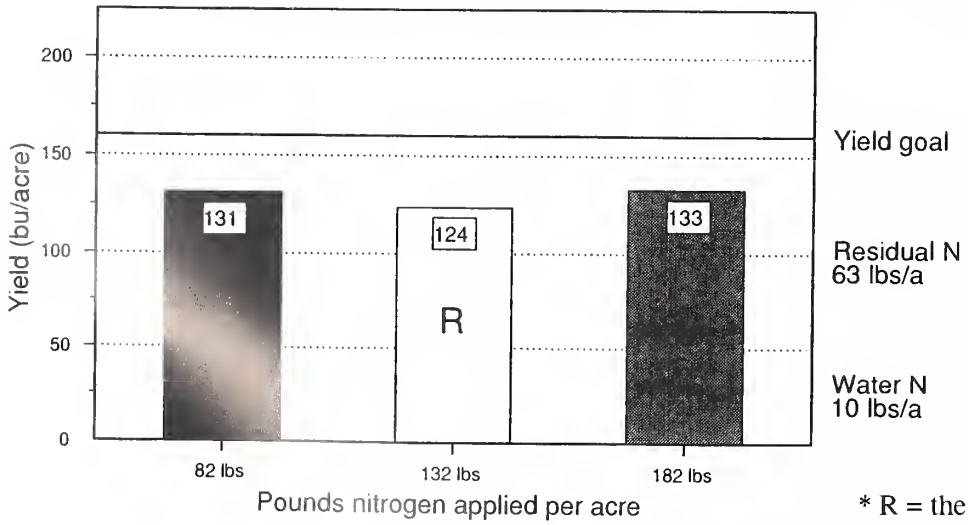
Al included nitrogen rate comparison plots in this field. The plots were 12 rows wide, 1,290 feet long and replicated four times. The treatments are shown in the graph below. Al's yields were low in 1992 due to hail damage that occurred on July 4, 1992. Anhydrous ammonia was applied preplant.

The recommended rate of nitrogen was determined using a 160-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation water nitrogen from the nitrogen required for 160 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation water accounted for 5.0 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water.

Yield Results

Yield goal: 160 bu/acre

N required for yield goal: 132 lbs/acre



* R = the UN-L recommended rate

General Fertility	
pH	5.9
OM	2.8%
P	12 ppm
K	180 ppm
Zn	0.88 ppm

Treatment	-50	Rec	+50
N rate (lbs/acre)	82	132	182
Yield avg. (bu/acre)	131	124	133
Test wt. (lbs/bu)	58	57	57
Moisture (%)	20.8	20.8	21.2

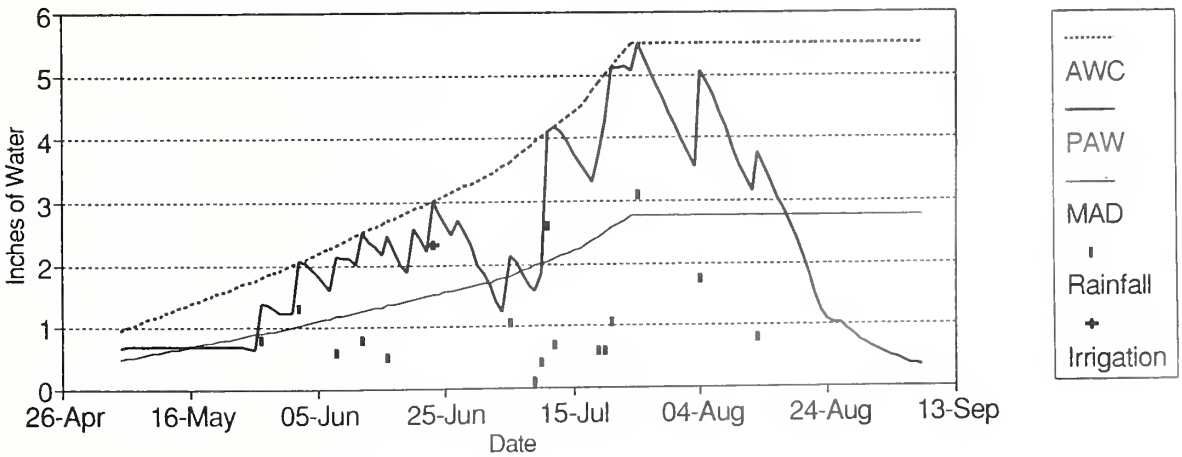
Year		Water N (lbs/acre)	Soil Res-N (lbs/acre)	N Applied (lbs/acre)	Yield (bu/acre)	2-Year Average	
1991	-50			15	130		
	Rec		**167**	**65**	**137**	Avg N Applied	Avg Yield
	+50			115	139		
1992*	-50	10	65	82	131	49	131
	Rec		**63**	**132**	**124**	**99**	**131**
	+50		103	182	133	149	136

** 1992 yields were lowered due to hail damage.*

Irrigation Management:

This site was sprinkler irrigated. Irrigation was scheduled in 1992 using soil moisture blocks, appearance and feel, and the checkbook methods. The field received 16.75 inches of rainfall between May 1 and September 9, 1992, and 2.33 inches of water were applied in two irrigations.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.

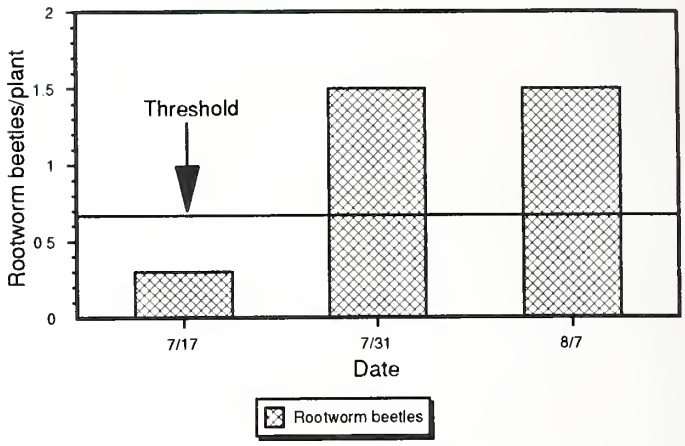


Integrated Pest Management:

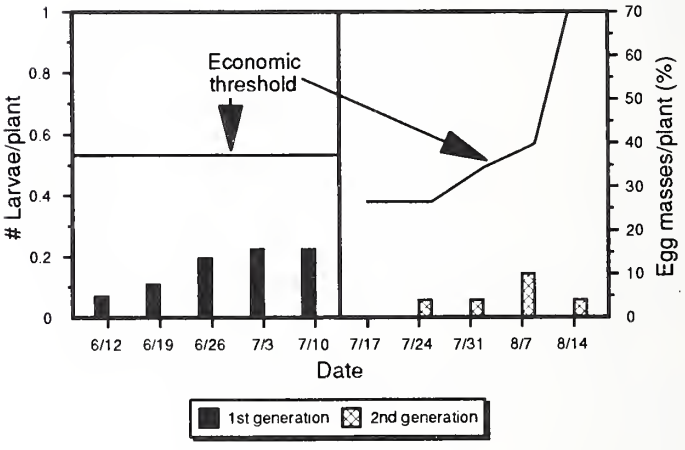
The field was cultivated on June 16 and hilled on June 22. The threshold of rootworm beetles was exceeded on July 31 with 1.5 beetles/plant.

European corn borer did not exceed the threshold for either first or second generations.

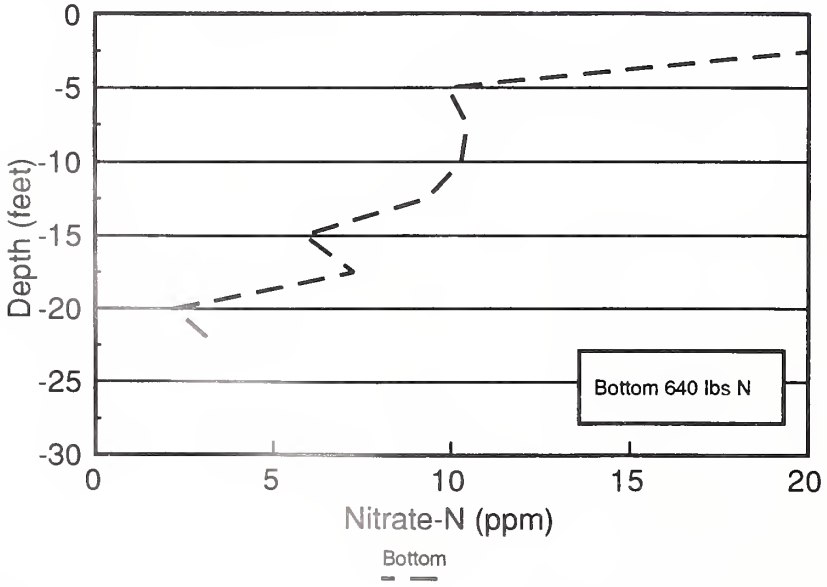
Rootworm Management



Corn Borer Management



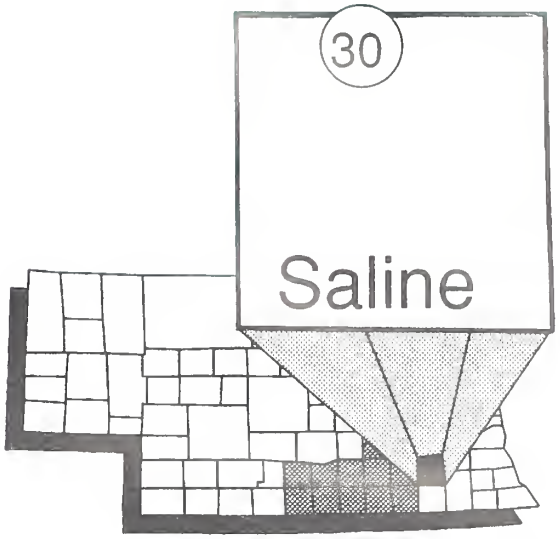
Vadose Zone Nitrate



The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

Site 30

Keith Spohn - Saline County



General Information:

Site 30 is on the Keith Spohn farm located three miles east and two miles north of Friend in Saline County. The soil type is a Hastings silt loam with a 0-1 percent slope.

Keith disked and field-cultivated prior to planting Pioneer 3162 in 30-inch rows on April 28. He applied fertilizer by sidedress. Harvest population was 26,750 plants/acre.

Nitrogen Management:

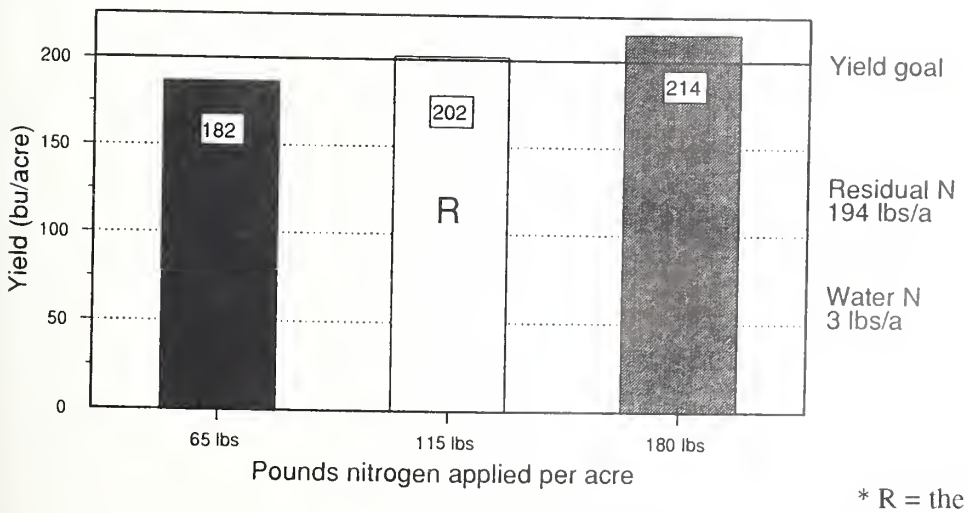
Keith included nitrogen rate comparison plots in this field. The plots were eight rows wide, 2,472 feet long, and replicated four times. The treatments are shown in the graph below. The entire amount of nitrogen was applied as anhydrous in a sidedress application May 29.

The recommended rate of nitrogen was determined using a 200-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 200 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation nitrogen accounted for 1.3 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water.

Yield Results

Yield goal: 200 bu/acre

N required for yield goal: 115 lbs/acre



* R = the UN-L recommended rate

General Fertility	
pH	6.1
OM	2.7%
P	56 ppm
K	408 ppm
Zn	3.41 ppm
S	8 ppm

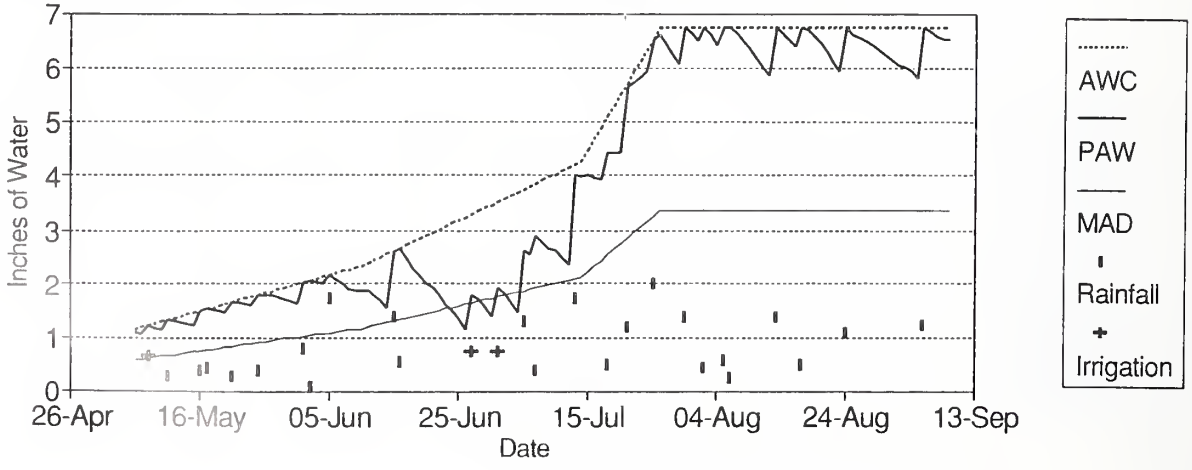
Treatment	-50	Rec	+50
N rate (lbs/acre)	65	115	180
Yield avg. (bu/acre)	182	202	215
Test wt. (lbs/bu)	57	57	56
Moisture (%)	21.1	20.6	21.4

Year		Water N (lbs/acre)	Soil Res-N (lbs/acre)	N Applied (lbs/acre)	Yield (bu/acre)	2-Year Average	
1991	-50	2		0	176		
	Rec		**197**	**50**	**191**	Avg N Applied	Avg Yield
	+50			100	204		
1992	-50	3	145	65	182	33	179
	Rec		**194**	**115**	**202**	**83**	**197**
	+50		433	180	215	140	210

Irrigation Management:

This site was pivot irrigated. Irrigation was scheduled in 1992 using soil moisture blocks and the checkbook method. The field received 19.30 inches of rainfall between May 1 and September 9, 1992, and 2.15 inches of water were applied in two irrigations.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



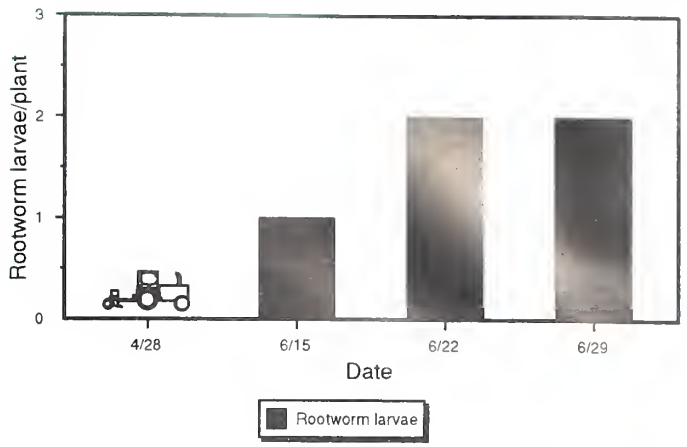
Integrated Pest Management:

Keith broadcasted .5 ounces of Accent plus one pint of Buctril plus .75 pint of atrazine on May 28. He cultivated on June 15.

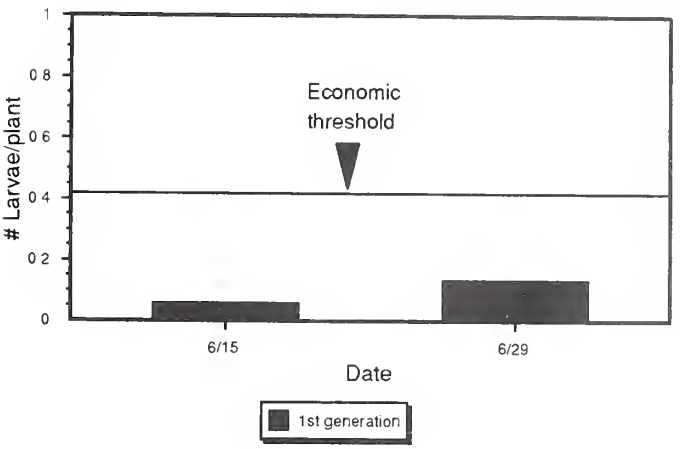
Keith was in the process of changing to the rootworm beetle control program for 1993. He managed this year's rootworms with 8.8 pounds of Force in a band at planting time. He chose to spray the field with one pint of Penncap-M three times (July 23, August 7, and August 19) to control rootworm beetles for 1993.

European corn borer never reached threshold levels for either first or second generations.

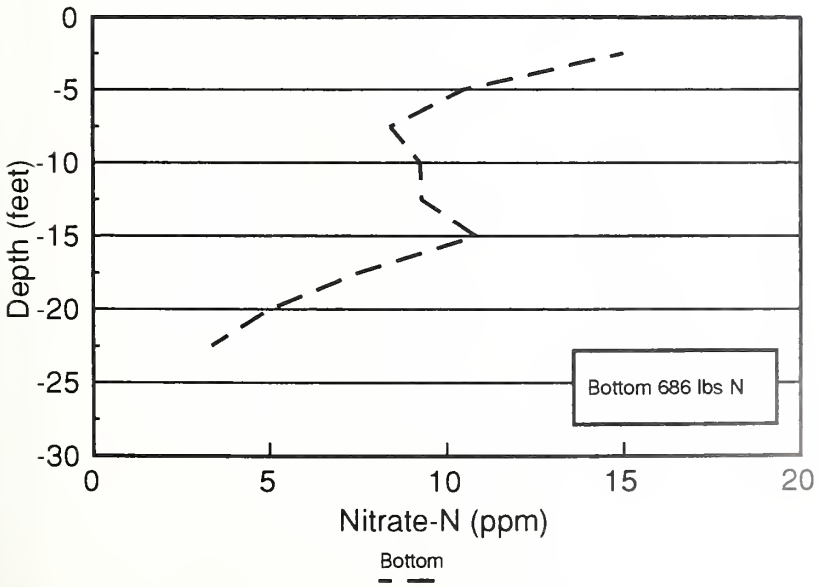
Rootworm Management



Corn Borer Management



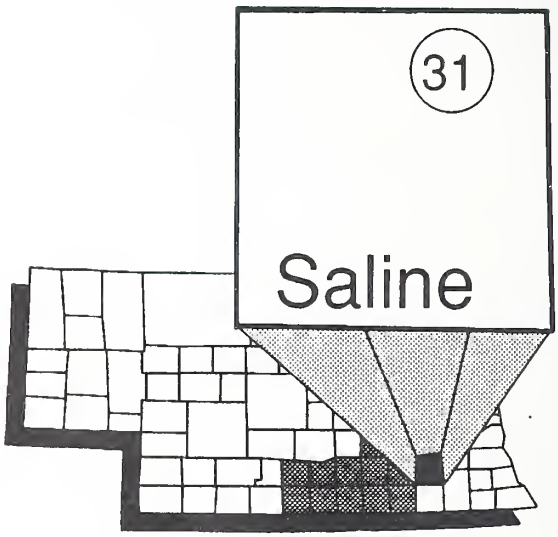
Vadose Zone Nitrate



The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

Site 31

Wayne Hansen - Saline County



General Information:

Site 31 is located on the Wayne Hansen farm one mile north of Dorchester on Highway 15 in Saline County. The plot area has been in continuous corn production, while other parts of the farm have been in a corn/soybean rotation. The soil type is a Crete silt loam with a 0-1 percent slope.

Wayne planted Jaques 8210 on May 1 in 30-inch rows. He applied NH_3 prior to planting. Harvest population was 27,000 plants/acre.

Nitrogen Management:

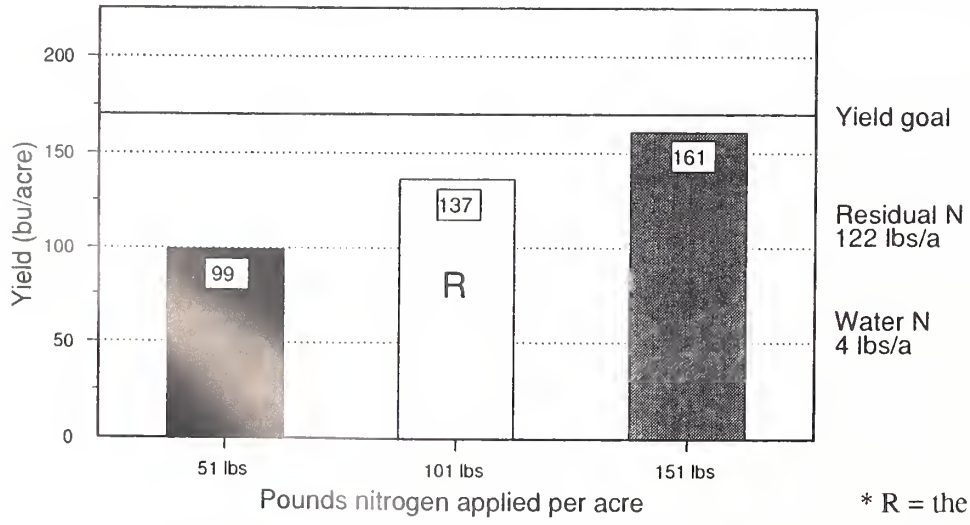
Wayne included nitrogen rate comparison plots in this field. The plots were 12 rows wide, 1,967 feet long, and replicated four times. The treatments are shown in the graph below. The entire amount of nitrogen was applied as anhydrous in a preplant application.

The recommended rate of nitrogen was determined using a 170-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 170 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation nitrogen accounted for 1.9 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water. Wayne's yields appear to be reduced by two factors; the loss of nitrogen from denitrification and the effects of a tornado which struck his farm in mid-June.

Yield Results

Yield goal: 170 bu/acre

N required for yield goal: 101 lbs/acre



* R = the UN-L recommended rate

General Fertility	
pH	6.6
OM	3.3%
P	56 ppm
K	432 ppm
Zn	3.77 ppm
S	8 ppm

Treatment	-50	Rec	+50
N rate (lbs/acre)	51	101	151
Yield avg. (bu/acre)	99	137	161
Test wt. (lbs/bu)	56	56	55
Moisture (%)	18.3	18.4	18.9

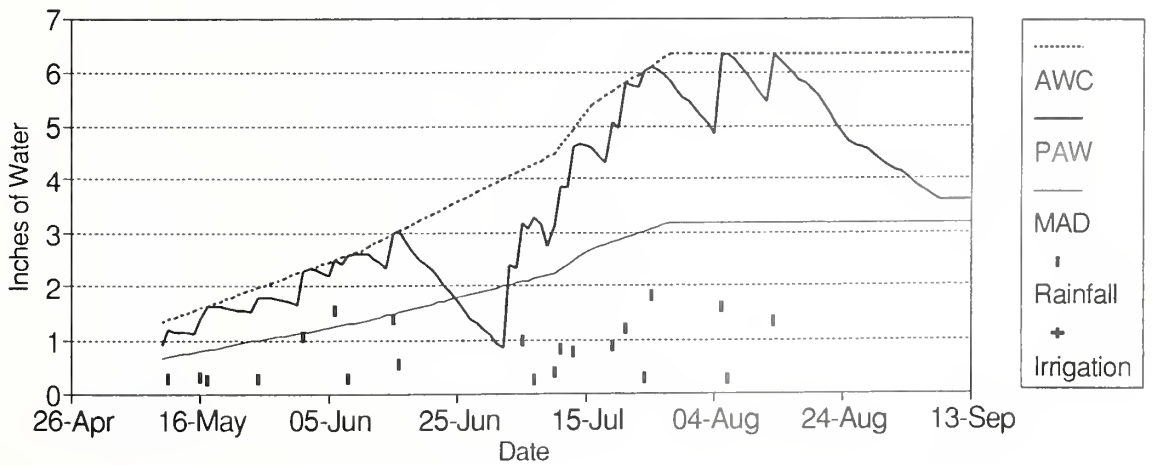
Year		Water N (lbs/acre)	Soil Res-N (lbs/acre)	N Applied (lbs/acre)	Yield (bu/acre)	2-Year Average	
	-50			96	176		
1991	**Rec**		**59**	**146**	**185**	Avg N Applied	Avg Yield
	+50			196	192		
	-50	4	112	51	99	74	138
1992*	**Rec**		**122**	**101**	**137**	**124**	**161**
	+50		147	151	161	174	177

** Yields were reduced in 1992 due to loss of nitrogen from denitrification as well as tornado damage.*

Irrigation Management:

This site was gravity irrigated, watering alternate (every other) furrows. Irrigation was scheduled in 1992 using soil moisture blocks and the checkbook method. The field received 16.65 inches of rainfall between May 1 and September 9, 1992, and no irrigation water was applied.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



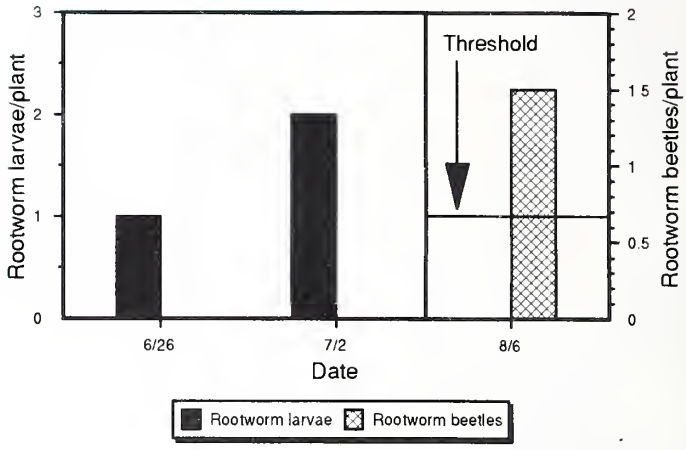
Integrated Pest Management:

Wayne banded one pint of Lasso at planting and broadcast Buctril and atrazine on May 27.

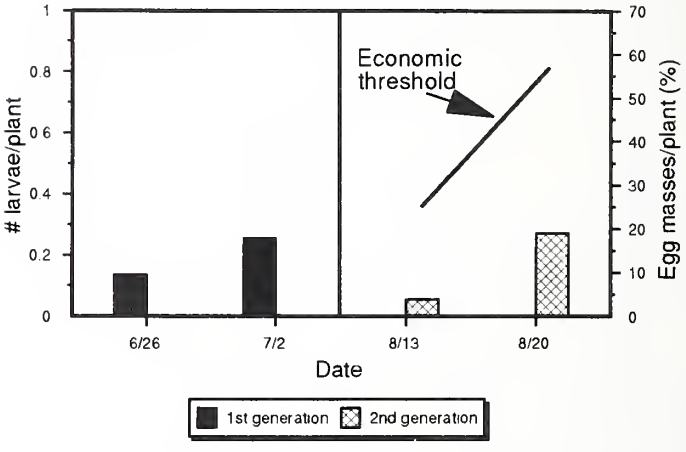
Rootworm control was achieved with a cultivation application of 6.5 ounces of Thimet. Rootworm beetles were treated on August 8.

European corn borer did not reach the threshold for first or second generations. The areas damaged by the tornado had high insect activity and Wayne chose to make the August 8 treatment.

Rootworm Management

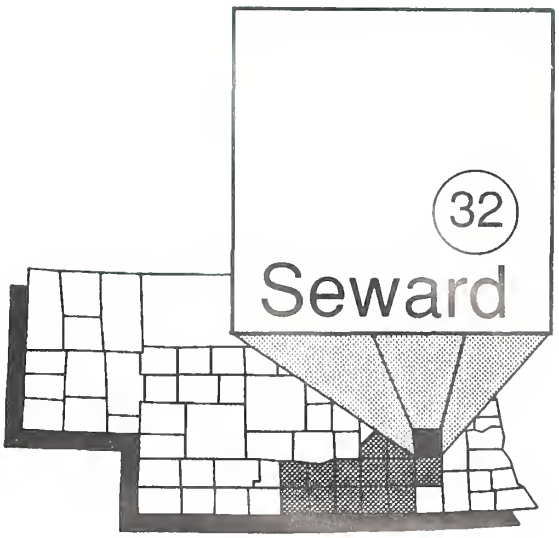


Corn Borer Management



Site 32

Dean Rocker - Seward County



General Information:

Site 32 is located on the Dean Rocker farm 2½ miles east and one mile south of Tamora. This gravity-irrigated farm has been in continuous corn production. The soil type is a Fillmore silt loam with a 0-1 percent slope.

Dean shredded stalks on April 3 prior to broadcasting a liquid fertilizer on April 18. The plot was planted with Stine 1180 and received starter fertilizer on April 28. Harvest population was 27,400 plants/acre.

Nitrogen Management:

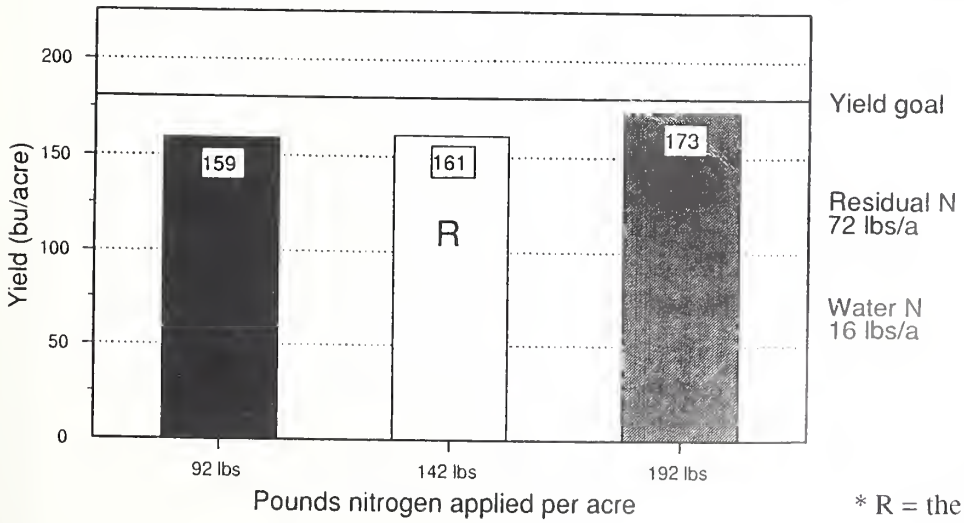
Dean included nitrogen rate comparison plots in this field. The plots were eight rows wide, 2,552 feet long, and replicated four times. The treatments are shown in the graph below. The nitrogen was split-applied. Thirty-nine pounds of 28-0-0 were broadcast-applied on April 18. The remainder of the nitrogen was applied in a sidedress application using anhydrous on June 15, except for five pounds that were applied with the seed in the form of 10-34-0 liquid starter.

The recommended rate of nitrogen was determined using a 180-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 180 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation nitrogen accounted for 7.7 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water. Reduced yields on the minus 50 and recommended treatments appear to be from a loss of nitrogen from denitrification.

Yield Results

Yield goal: 180 bu/acre

N required for yield goal: 142 lbs/acre



* R = the UN-L recommended rate

General Fertility	
pH	5.8
OM	3.1%
P	16 ppm
K	385 ppm
Zn	1.01 ppm

Treatment	-50	Rec	+50
N rate (lbs/acre)	92	142	192
Yield avg. (bu/acre)	159	161	173
Test wt. (lbs/bu)	56	56	56
Moisture (%)	20.2	20.7	21.0

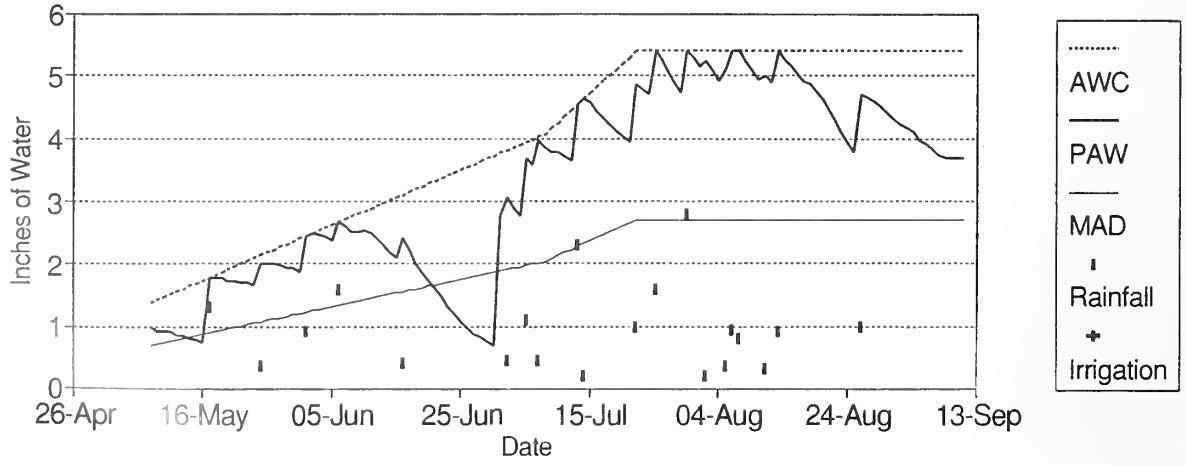
Year		Water N (lbs/acre)	Soil Res-N (lbs/acre)	N Applied (lbs/acre)	Yield (bu/acre)	2-Year Average	
	-50			80	167		
1991	**Rec**		**92**	**130**	**171**	Avg N Applied	Avg Yield
	+50			180	168		
	-50	4	58	92	159	86	163
1992*	**Rec**		**72**	**142**	**161**	**136**	**166**
	+50		156	192	173	186	171

** Yields were reduced in 1992 due to loss of nitrogen from denitrification.*

Irrigation Management:

This site was gravity irrigated, watering alternate(every other) furrrows. Irrigation was scheduled in 1992 using the appearance and feel and the checkbook method. The field received 17.95 inches of rainfall between May 1 and September 9, 1992, and 3.06 inches of water were applied in one irrigation.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



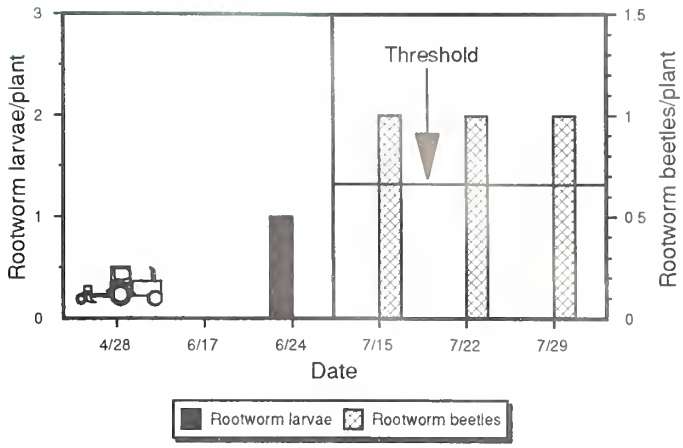
Integrated Pest Management:

Dean broadcast 0.5 pint of 2,4-D prior to planting and banded 1.5 pints of Lasso at planting. A post-directed spray of .9 pints of Laddock plus 0.5 gallon of 28 percent nitrogen was applied on June 5. The field was cultivated on June 5 and hilled on June 21.

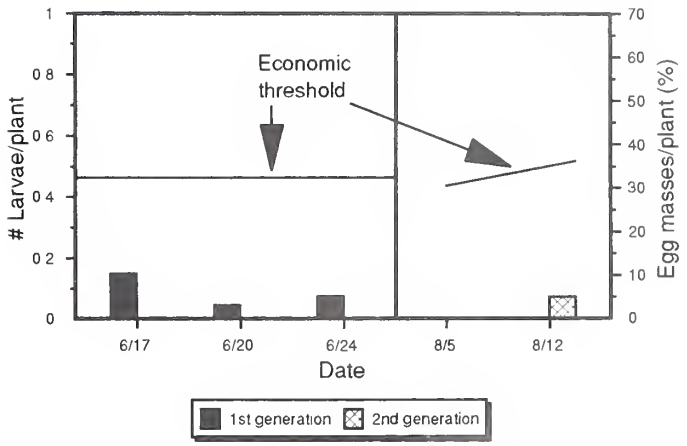
Dean used a planting-time application of five pounds of Counter for rootworm control. His rootworm beetle numbers exceeded the threshold, indicating there is a chance that larvae will cause losses in 1993 that exceed the treatment cost, if he plants corn in 1993.

European corn borer never reached threshold levels for either first or second generations.

Rootworm Management

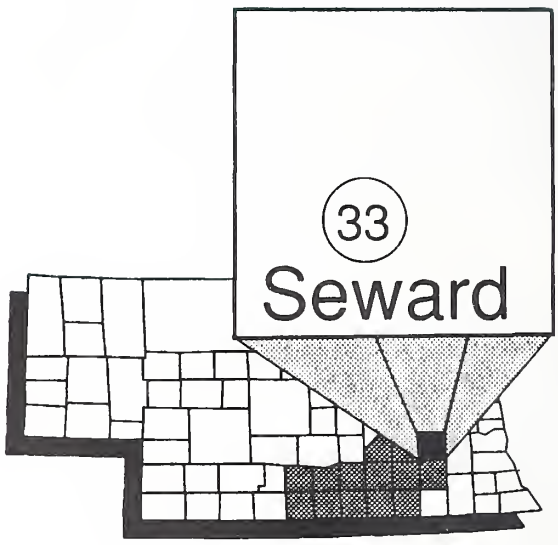


Corn Borer Management



Site 33

Doug Cast - Seward County



General Information:

Site 33 is located on the Doug Cast farm two miles south and one mile east of Utica in Seward County. This gravity-irrigated farm has been in continuous corn production. The soil type is a Fillmore silt loam with a 0-1 percent slope.

Doug knifed in NH_3 between the rows in mid-March prior to planting. He harrowed and ridge-planted the plot with NC+ 4616 on April 30 in 30-inch rows and applied a starter fertilizer. Harvest population was 23,750 plants/acre.

Nitrogen Management:

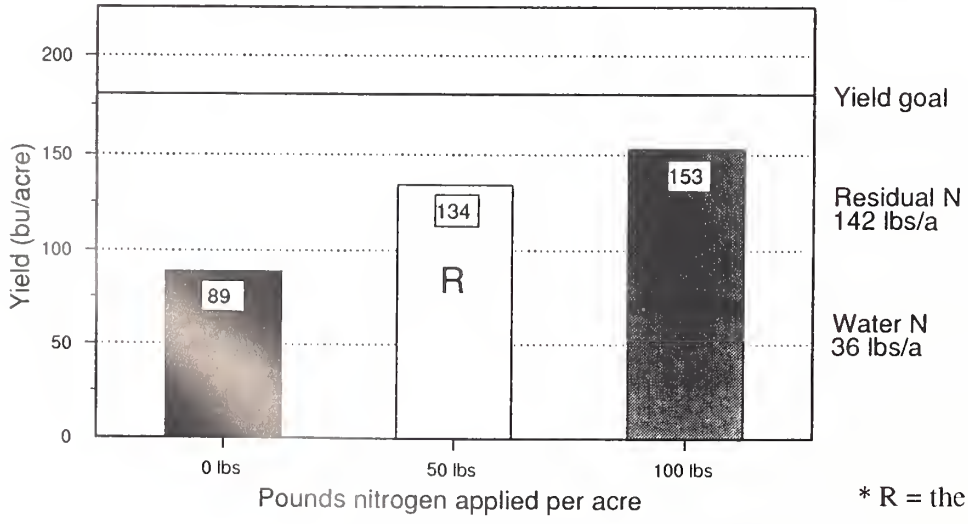
Doug included nitrogen rate comparison plots in this field. The plots were eight rows wide, 1,670 feet long, and replicated four times. The treatments are shown in the graph below. The entire amount of nitrogen was applied as anhydrous on March 16, except for four pounds that were applied as 10-34-00 starter fertilizer in the seed furrow.

The recommended rate of nitrogen was determined using a 180-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 180 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation nitrogen accounted for 17.6 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water. Poor drainage appeared to cause a significant loss of nitrogen from denitrification, resulting in significant yield losses on the minus 50 and recommended rate treatments.

Yield Results

Yield goal: 180 bu/acre

N required for yield goal: 50 lbs/acre



* R = the UN-L recommended rate

General Fertility	
pH	6.7
OM	2.9%
P	24 ppm
K	431 ppm
Zn	2.30 ppm

Treatment	-50	Rec	+50
N rate (lbs/acre)	0	50	100
Yield avg. (bu/acre)	89	134	153
Test wt. (lbs/bu)	55	55	55
Moisture (%)	18.6	18.6	19.3

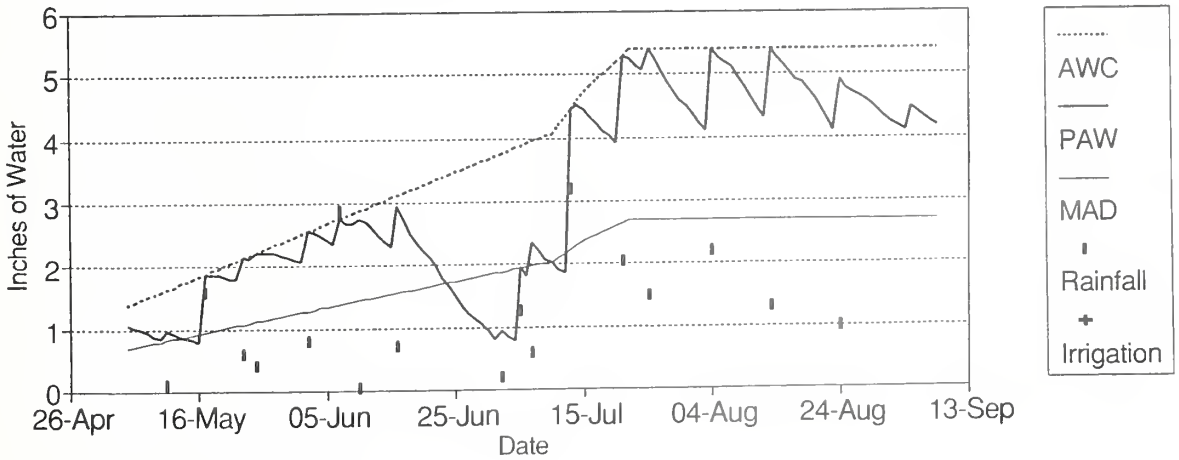
Year		Water N (lbs/acre)	Soil Res-N (lbs/acre)	N Applied (lbs/acre)	Yield (bu/acre)	2-Year Average	
1991	-50			120	161		
	Rec		**71**	**170**	**168**	Avg N Applied	Avg Yield
	+50			220	169		
1992*	-50	36	105	0	89	60	125
	Rec		**142**	**50**	**134**	**110**	**151**
	+50		138	100	153	160	161

** Yields were reduced in 1992 due to loss of nitrogen from denitrification.*

Irrigation Management:

This site was gravity irrigated, watering alternate (every other) furrows. Irrigation was scheduled in 1992 using soil moisture blocks and the checkbook method. The field received 19.45 inches of rainfall between May 1 and September 9, 1992, and no irrigation occured in 1992.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



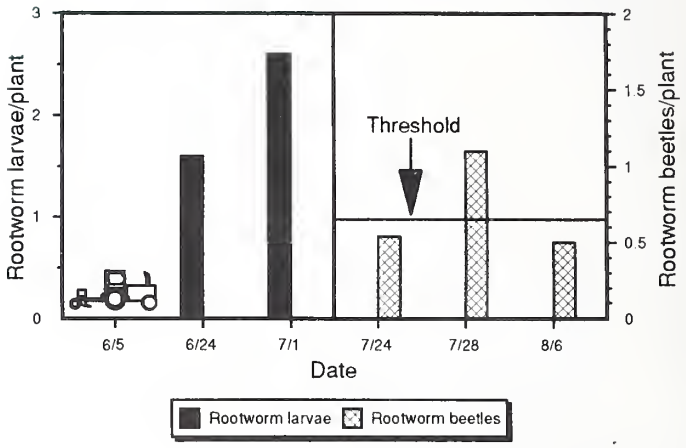
Integrated Pest Management:

Doug banded 3.5 pints of Bullet on May 30. He cultivated the field on June 5.

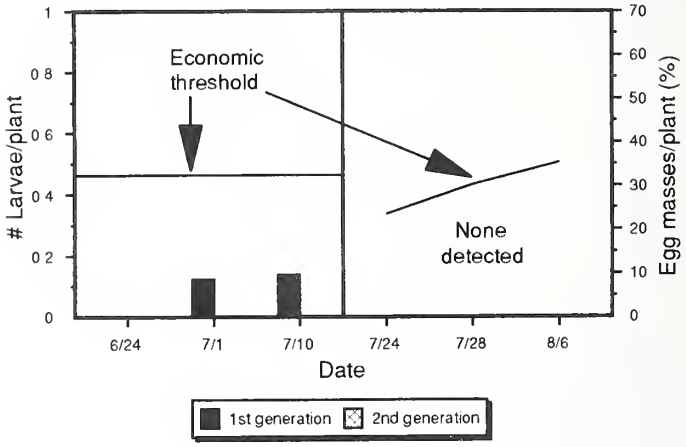
Doug controled rootworm with a cultivation treatment of eight ounces of Thimet banded per 1,000 feet. His rootworm beetle counts exceeded the threshold on July 28 at 1.1 beetles/plant . This would indicate that there is a chance that rootworms will cause more damage than the cost of treatment in 1993 if he does plant corn.

European corn borer never reached threshold levels for either first or second generations.

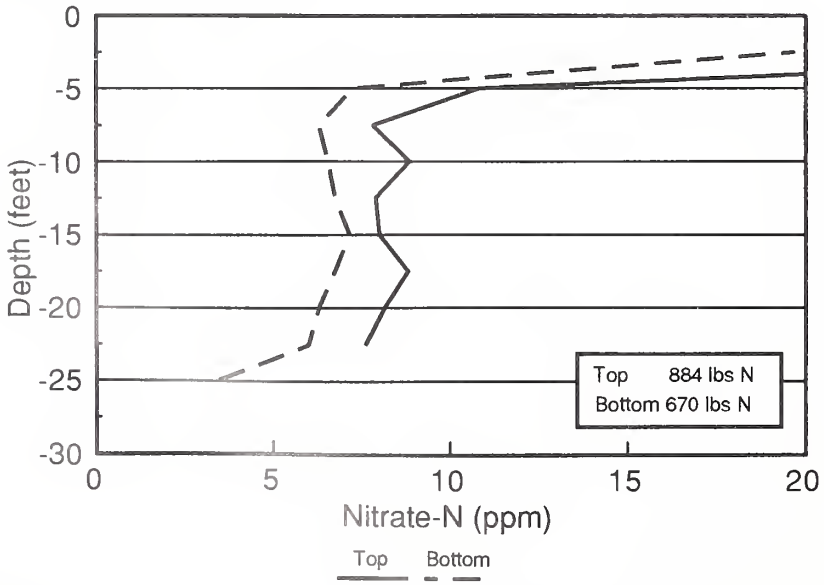
Rootworm Management



Corn Borer Management



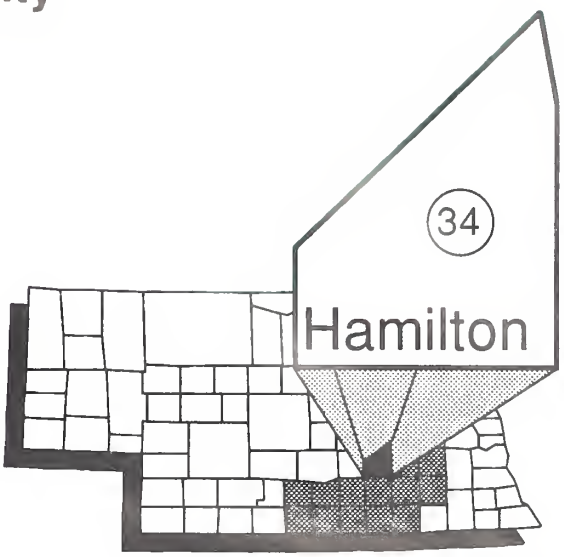
Vadose Zone Nitrate



The graph on the left shows the nitrate concentration below the root zone. Nitrate is water soluable and moves under gravitational pull toward the groundwater. The rate of movement has been estimated at two to three feet per year in these soils. Subsoil characteristics influence the rate of water movement and would be expected to cause increased concentration of nitrate where permeability is decreased.

Site 34

The Grain Place - Hamilton County



General Information:

Site 34 is operated by Mike Hermann of the Grain Place and is located 5 ½ miles north of Aurora in Hamilton County. The soil type is a Holder silt loam with a 0-1 percent slope.

Mike disked on April 25 and harrowed on April 28. He planted X715 Experimental-Keith Heuermann FR1064xfr36WC between April 30 and May 1. Then he applied fish & sea kelp fertilizer by foliar on June 19.

The Grain Place is an organic farm. The operators employ a system approach to crop production which requires extensive rotation of crops.

One of the goals of the system is to create a healthy soil environment with adequate organic matter to reduce some of the need for fertilizer supplement. The intention is to grow healthy, well-nourished plants that can endure some damage from the weather and insects.

The current rotation is shown in Table 1 on the following page. The rotation features changes in plants from grasses to broadleaf. This gives the opportunity to use plant competition, cultivation and hand rouging to control weeds. It also disrupts insect cycles; for instance, corn rootworm is not a problem in the fields. The legumes in the rotation help meet some of the nitrogen needs.

A new rotation (see Table 2 on the following page) is being planned to allow three-year stands of alfalfa . This should provide more nitrogen for the following crops and has the benefit of a perennial crop to assist with weed control.

Irrigation management employs flow meters and the recent addition of a surge valve. The operators use moisture blocks and evapotranspiration data in an irrigation schedule that attempts to minimize water application without excessive stress on the crop. They hope to reduce leaching below the root zone as much as possible.

Introducing adequate levels of nutrients into the system with very small resources of manure is a challenge.

Table 1. Cropping Plan for 1992.

1 1992 Corn Irrigated well	2 1992 Soybeans Irrigated	3 1992 Soybeans Irrigated
4 1992 Oats & Wheat Dryland	5 1992 Popcorn Irrigated	6 1992 Alfalfa & Red Clover Dryland well

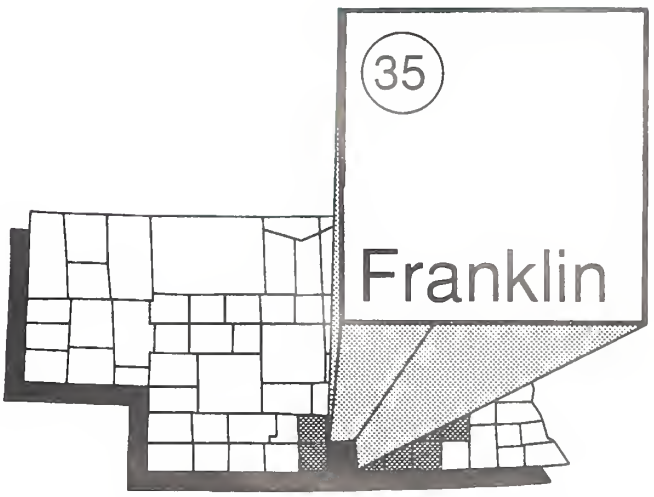
Table 2. Cropping rotation plans for 1989-1994.

	1	2	3	4	5	6
1989	B	O	C	B	B	PC
1990	B	♦	B	PC	C	B
1991	B	C	PC	B	B	O
1992	C	B	B	O	PC	♦
1993	B	PC	O	♦	B	C
1994	PC	B	♦	C	O	B

B = soybeans C = corn PC = popcorn O = oats ♦ = alfalfa

Site 35

Butch Ortgiesen - Franklin County



General Information:

Site 35 is located on the Butch Ortgiesen farm, seven miles south and one mile east of Wilcox in Franklin County. The plot area is in continuous corn production. The soil type is a Holdrege silt loam with a 0-1 percent slope.

Butch shredded stalks prior to planting Pioneer 3162 in 36-inch rows on April 22. He split-applied fertilizer as a preplant application. Harvest population was 22,000 plants/acre.

Nitrogen Management:

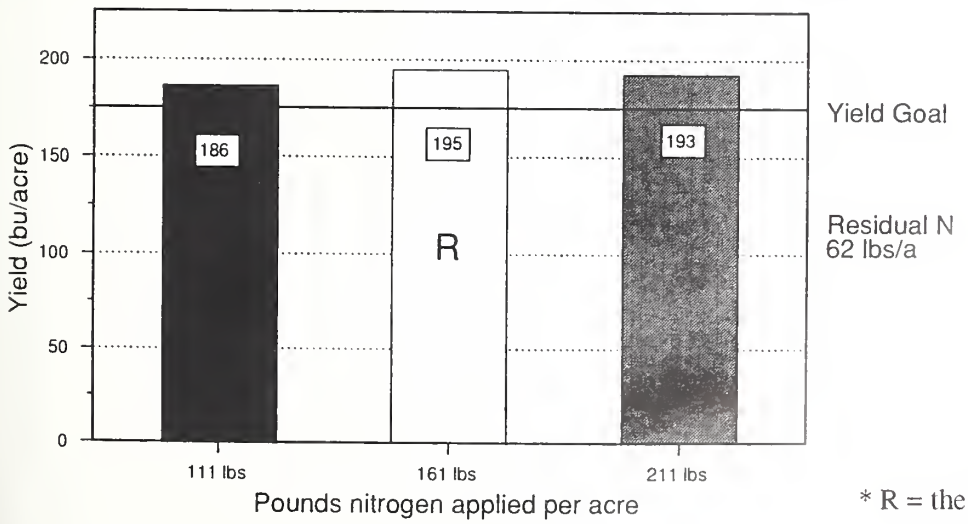
Butch included nitrogen rate comparison plots in this field. The plots were eight rows wide, and 1,443 feet long and replicated four times. The treatments are shown in the graph below. Butch's yields exceeded the yield goal in 1992. All nitrogen was applied preplant. Dry 11-52-0 was broadcast on April 1, 1992, at a rate of 100 pounds/acre. Anhydrous ammonia was knifed in on April 10, 1992.

The recommended rate of nitrogen was determined using a 175-bushel yield goal. The rate applied was calculated by subtracting soil nitrogen from the nitrogen required for 175 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. Irrigation water nitrate was not accounted for because this was the first year of Butch's plot. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This was conservative and was based on a yearly application of nine inches of water.

Yield Results

Yield goal: 175 bu/acre

N required for yield goal: 161 lbs/acre



* R = the UN-L recommended rate

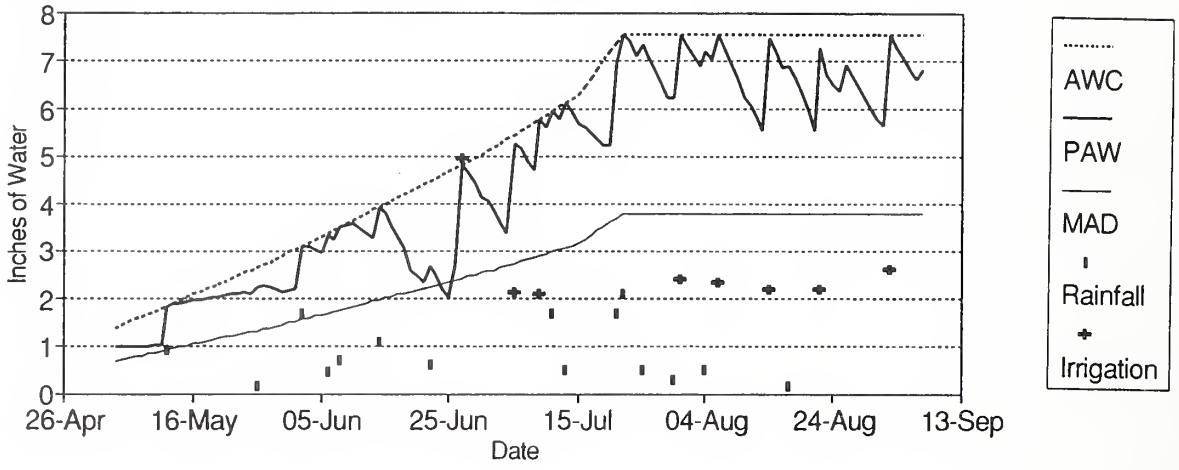
General Fertility	
pH	6.6
OM	2.9%
P	24 ppm
K	450 ppm
Zn	2.55 ppm

Treatment	-50	Rec	+50
N rate (lbs/acre)	111	161	211
Yield avg. (bu/acre)	185	195	193
Test wt. (lbs/bu)	55	55	55
Moisture (%)	21.5	21.4	21.3

Irrigation Management:

This site was gravity irrigated, watering every furrow. Irrigation was scheduled in 1992 using the appearance and feel and the checkbook methods. The field received 13.95 inches of rainfall between May 1 and September 9, 1992, and 20.95 inches of water were applied in eight irrigations.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred. Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.

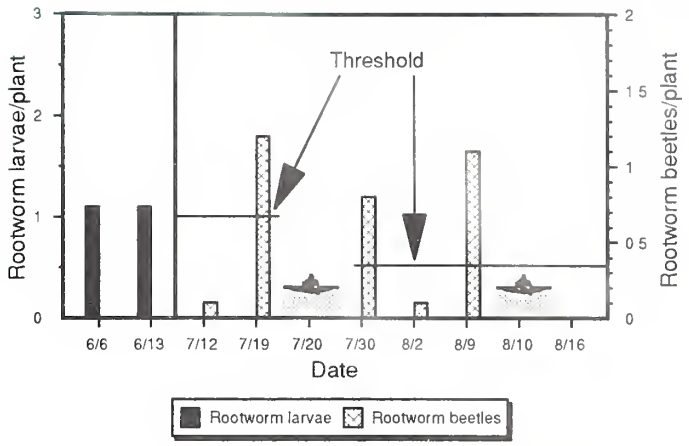


Integrated Pest Management:

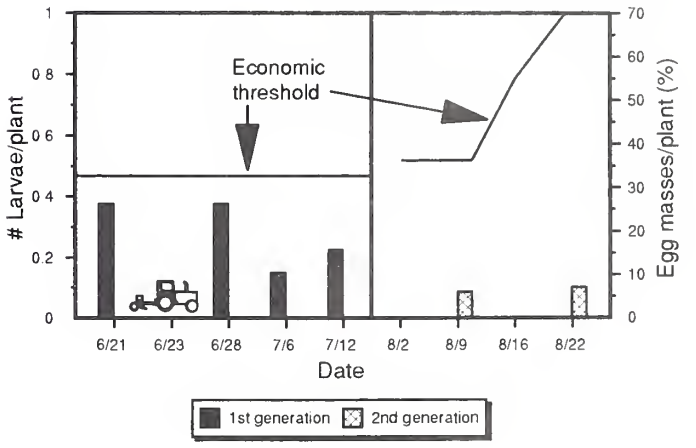
Rootworm larvae were managed with the beetle control program. Soil insecticide was not used. The threshold of rootworm beetles was exceeded on July 19 with 1.2 beetles/plant. An aerial application of two pints of Penncap-M was applied on July 20. Beetle numbers rose above the threshold on August 9 and the field was re-treated with two pints of Penncap-M on August 10.

First-generation European corn borer exceeded the threshold on June 21. The field was treated with five pounds of Dipel granules on June 23. Second-generation European corn borer did not reach threshold levels.

Rootworm Management

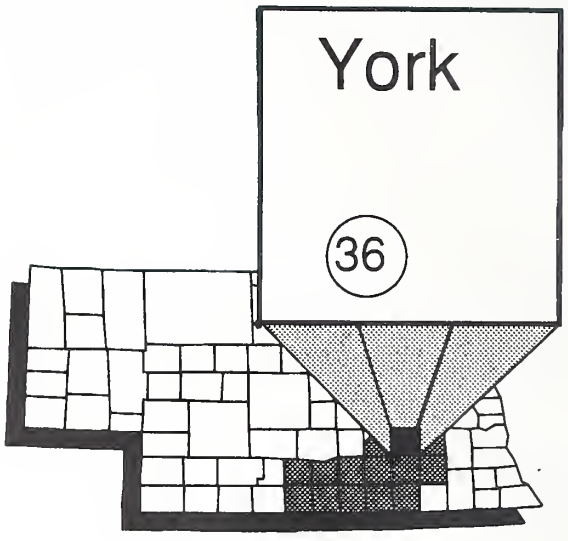


Corn Borer Management



Site 36

Brian Janzen - York County



General Information:

Site 36 is located on the Brian Janzen farm three miles south and 3½ miles east of Henderson in York County. The soil type is a Hastings silt loam with a 0-1 percent slope.

Brian knifed in NH_3 on April 2 before shredding stalks on April 11. He planted Pioneer 3162 in 36-inch rows and applied a starter fertilizer on April 30. Harvest population was 26,700 plants/acre.

Nitrogen Management:

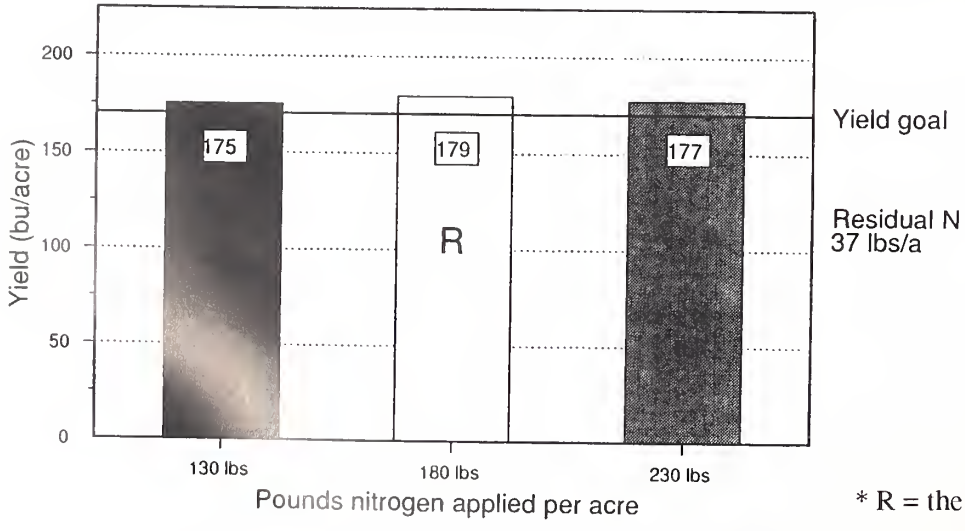
Brain included nitrogen rate comparison plots in this field. The plots were six rows wide, 1,283 feet long, and replicated four times. The treatments are shown in the graph below. The entire amount of nitrogen was applied as anhydrous on April 2, except for five pounds that were applied with the seed in the form of 10-34-0 liquid starter.

The recommended rate of nitrogen was determined using a 170-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 170 bushels of corn. The soil nitrate for this first-year plot was measured in 15 four-feet deep soil samples taken from the plot area.

Yield Results

Yield goal: 170 bu/acre

N required for yield goal: 180 lbs/acre



* R = the UN-L recommended rate

General Fertility	
pH	6.2
OM	2.3%
P	22 ppm
K	330 ppm
Zn	0.44 ppm
S	9 ppm

Treatment	-50	Rec	+50
N rate (lbs/acre)	130	180	230
Yield avg. (bu/acre)	175	178	177
Test wt. (lbs/bu)	55	55	56
Moisture (%)	24.9	23.7	25.1

Irrigation Management:

This site was gravity irrigated, watering every furrow. Irrigation was scheduled in 1992 using soil moisture blocks and the checkbook method. The field received 18.75 inches of rainfall between May 1 and September 9, 1992. There was not a flow meter on this well, therefore no application amounts are available.

Integrated Pest Management:

Brian applied two pounds of atrazine at planting time as a band treatment. The field was cultivated on May 27 and hilled on June 18.

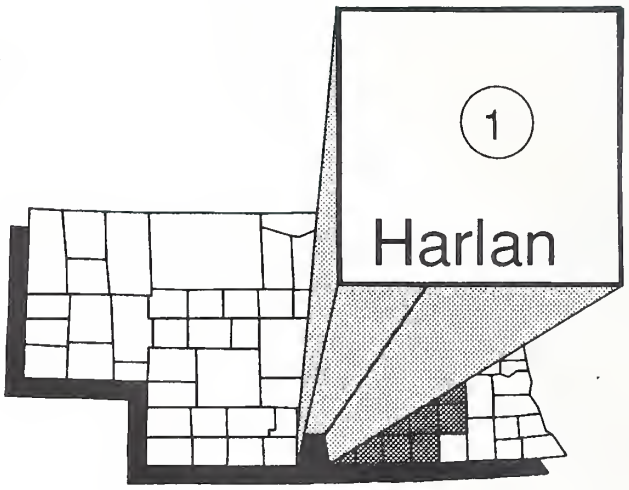
Rootworms were controlled with a soil treatment of 4.7 pounds of Lorsban at planting. Brian scouted his own fields and found no justification for any other insect control.

Site 1

Al Hollertz - Harlan County

General Information:

Al planted soybeans on the site in 1992. Rotation of corn and soybeans reduces his need for insecticide. He does not apply rootworm insecticide and generally has less of a mid-season insect problem with the soybeans than with corn. The rotation is also a disease management strategy as the field is known to have corn lethal necrosis which is minimized by rotation with soybeans.

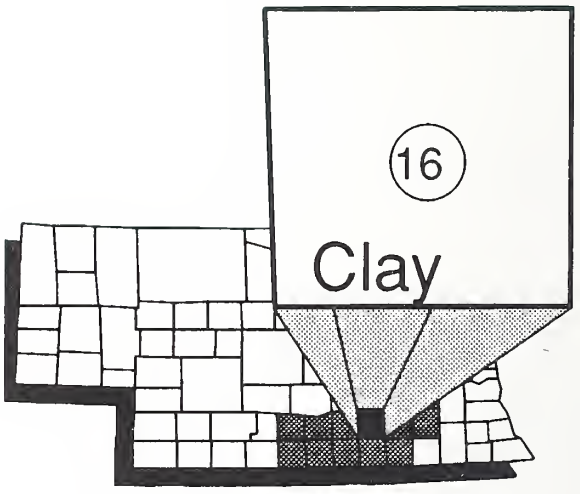


Site 16

Steve Yost - Clay County

General Information:

Steve rotated the field to soybeans in 1992. The rotation reduces his need for insecticide. He does not use rootworm insecticide and generally has fewer mid-season problems that might require insecticide on soybeans than with corn.



Who to contact in your area for more information...

Adams County

Ken Franzen, SCS, 2727 W. 2nd, Suite 102, Hastings, NE 68901, 462-5412
Paul Swanson, CE, P.O. Box 30, Hastings, NE 68901, 461-7209
Douglas Carter, ASCS, 2727 W. 2nd, Hastings, NE 68901, 463-6771
Cooperators:
Bruce Bohlen, RR 1, Box 201, Glenvil, NE 68941, 463-6371
Larry Christenson, RR 1, Box 13, Campbell, NE 68932, 756-5363
Myles Ramsey, Rt. 1, Box 83, Kenesaw, NE 68956, 752-8134
William McLeod, RR 1, Box 159, Juniata, NE 68955, 751-2752
Milton Ruhter, RR 1, Box 188, Juniata, NE 68955, 751-2398

Clay County

Richard Hayes, SCS, 209 W. Fairfield, Clay Center, NE 68933, 762-3569
Chuck Burr, CE, Clay Center, NE 68933, 762-3644
David Studnicka, ASCS, 100 S. Alexander, Clay Center, NE 68933, 762-3521
Cooperators:
Dave Hamburger, RFD 2, Harvard, NE 68944, 463-8072
Steve Yost, 109 N. Clay, Clay Center, NE 68933, 762-3845

Fillmore County

Kent Norquest, SCS, 120 S. 12th St., Rm 2, Geneva, NE 68361, 759-4017
Tom Dorn, CE, 972 G. St., Geneva, NE 68361, 759-3712
Bryan Dohrman, ASCS, Box 426, Geneva, NE 68361, 759-4463
Cooperators:
Jim Bedlan, 606 Swartzendruber Drive, Shickley, NE 68436, 627-3745
Howard Lefler, RR 1, Box 12, Fairmont, NE 68354, 268-6511

Franklin County

E. Joe Vavricka, SCS, 713-15th Ave., Franklin, NE 68939, *425-6276
Alan Corr, CE, P.O. Box 306, Franklin, NE 68939, *425-6277
James Shelton, ASCS, Box 126, Franklin, NE 68939, *425-6234
Cooperators:
John Jelken, RR 1, Box 119, Hildreth, NE 68947-9736, *775-3273
Butch Ortgiesen, Rural Route, Wilcox, NE 68982, *478-5270

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Hamilton County

Dennis Schroeder, SCS, 1611 10th St., Aurora, NE 68818, 694-3500
Andy Christiansen, CE, P.O. Box 308, Aurora, NE 68818, 694-6174
Kelly Grossnicklaus, ASCS, Box 148, Aurora, NE 68818, 694-3122
Cooperators:
Joel Anderson, P. O. Box 175, Polk, NE 68654, 765-3741
Curt Carlson, Rt 1, Box 146, Marquette, NE 68854, 854-3151
Carey Friesen, Rural Route, Henderson, NE 68371, 723-4260
Clayton Higgins, RR 1, Giltner, NE 68841, 849-2216
The Grain Place, Mike Hermann, RR 1, Box 163, Marquette, NE 68854, 854-3195

Harlan County

James D. Miller, SCS, P.O. Box 320, Alma, NE 68920, *928-2626
Tony Anderson, CE, Box 258, Alma, NE 68920, *928-2119
Lee Christenson, ASCS, Box 410, Alma, NE 68920, *928-2172
Cooperators:
Al Hollertz, Rt 2, Box 206A, Holdrege, NE 68949, *567-2243

Kearney County

Buddy Steinshouer, SCS, 640 N. Minden Ave., Minden, NE 68959, *832-1895
Alan Corr, CE, Box 31, Minden, NE 68959, *832-1155
Richard Booker, ASCS, Box 240, Minden, NE 68959, *832-2280
Cooperators:
Dean Casper, RR 3, Minden, NE 68959, *832-1653
Dave Nielsen, Rt 2, Box 10, Minden, NE 68959, *832-0556

Nuckolls County

Larry Waneking, SCS, P.O. Box 307, Nelson, NE 68961, 225-2311
Steve Melvin, CE, Box 386, Nelson, NE 68961, 225-2381
Dale Kovanda, ASCS, Box 367, Nelson, NE 68961, 225-3401
Cooperators:
Don Kottmeyer, RR 1, Box 106, Hardy, NE 68943, 279-2625
Lale Oellerich, RR 2, Davenport, NE 68335, 364-2379

Phelps County

Buddy Steinshouer, SCS, 1308 2nd St., Holdrege, NE 68949, *995-6141
Gary Hall, CE, 1308 2nd St., Holdrege, NE 68949, *995-4222
Kevin Pesek, ASCS, Box 201, Holdrege, NE 68949, *995-6121
Cooperators:
Bruce Anderson, Rt 1, Box 18, Holdrege, NE 68949, *263-4151
Chris Erickson, Rural Route 3, Holdrege, NE 68949, *995-8421
Lloyd Erickson, Rural Route 3, Holdrege, NE 68949, *995-6286

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Polk County

Kristi Schleif, SCS, P.O. Box 526, Osceola, NE 68651, 747-2461
Coleen Pallas, CE, Box 215, Osceola, NE 68651, 747-2321
Ilene Anderson, ASCS, Box 547, Osceola, NE 68651, 747-2111
Cooperators:
Mark Newcomer, Box 68, Stromsburg, NE 68666, 764-5421

Saline County

Jerry Bucy, SCS, Box 741, Wilber, NE 68465, 821-2031
Randy Pryor, CE, Box 978, Wilber, NE 68465, 821-2151
Verne Anthony, ASCS, Box 686, Wilber, NE 68465, 821-2251
Cooperators:
Wayne Hansen, Rural Route 1, Dorchester, Ne 68343, 946-7341
Keith Spohn, RR 1, Box 120A, Friend, NE 68359, 947-8061

Seward County

Connie Tvrdy, SCS, 322 South 14th St., Seward, NE 68434, 643-6231
Dennis Kahl, CE, 216 South 9th St., Seward, NE 68434, 643-2981
Bruce Thompson, ASCS, Box 389, Seward, NE 68434, 643-4586
Cooperators:
Doug Cast, Rt 1, Box 810, Beaver Crossing, Ne 68313, 532-7515
Dean Rocker, RR 2, Box 164, Seward, NE 68434, 643-2318

Thayer County

Brian Euse, SCS, 1210 South Ave., Hebron, NE 68370, 768-6228
Steve Melvin, CE, Hebron, NE 68370, 768-7212
Michael Bantam, ASCS, Box 8, Hebron, NE 68370, 768-6520
Cooperators:
Effenbeck Farms, c/o Alfred Effenbeck, RR 1, Box 21, Deshler, NE 68340, 236-8748
Leroy Voss, Rural Route 1, Bruning, NE 68322, 353-3805

Webster County

Merle L. Illian, SCS, 20 N. Webster St., Red Cloud, NE 68970, 746-2268
Chuck Burr, CE, 621 N. Cedar, Red Cloud, NE 68970, 746-3417
Robert Bohrer, ASCS, Box 487, Red Cloud, NE 68970, 746-2204
Cooperators:
Kevin Karr, Rt 1, Box 126, Bladen, NE 68928, 756-1176

York County

William Gilliam, SCS, 212 W. 6th St., York, NE 68467, 362-4906
Gary Zoubek, CE, RFD 4, Box 46, York, NE 68467, 362-5508
Maxine Knauss, ASCS, Box 485, York, NE 68467, 362-7751
Cooperators:
Brad Rathje, Route 1, Box 124A, Waco, NE 68460, 728-5378
Jerry Stahr, RR 2, Box 75, York, NE 68467, 362-2574
Brian Janzen, RR 1, Box 59, Henderson, NE 68371, 723-4966

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